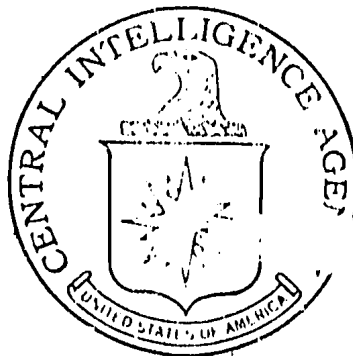


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SCIENTIFIC INFORMATION REPORT

Number 1

27 February 1958

Prepared by

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This report presents unevaluated information extracted from publications of the USSR, Eastern Europe, and China. The information selected is intended to indicate current scientific developments and activities in the USSR, in the Sino-Soviet Orbit countries, and in Yugoslavia, and is disseminated as an aid to United States Government research.

SCIENTIFIC INFORMATION REPORT

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NOTE: Items in this report are numbered consecutively.

I. ASTRONOMY

1. Space Rockets

"Trajectory of Rocket Flight Around the Moon," by M. S. Lisovskaya, Byull. In-ta teor. astron. AN SSSR, 1957, 6, No 8, 550-565 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 9, Sep 57, Abstract No 7164)

A limited plane problem of three bodies is analyzed, where the Earth and the Moon are considered as finite masses revolving on circles around their common center of gravity and the rocket a body of zero mass, having already received its thrust and moving under the action of terrestrial and lunar attraction without use of fuel. Trajectories satisfying the following conditions are plotted (a) at the initial instant the rocket is situated on the continuation of the radius-vector of the Moon, (b) at the initial instant the velocity of the rocket is perpendicular to the radius vector of the Moon, and (c) the trajectory either intersects with the Earth surface or passes at a certain defined distance from it.

It is demonstrated that the first two conditions secure the symmetry of the trajectory with respect to the right line connecting the centers of the Earth and the Moon at the initial instant of time. Six trajectories of this type are drawn, one of them is drawn by the usual method of numerical integration, and the remaining five by a particular graphic method devised by the author.

2. Zero-Mass Particle Motion in Gravity Field

"Periodic Motion of a Particle in the Gravity Field of a Rotating Triaxial Ellipsoid," by Yu. V. Batrakov, Byul. In-ta teor. astron. AN SSSR, 1957, 6, No 8, 524-542 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 9, Sep 57, Abstract No 7189)

The motion of a particle of zero mass is analyzed under the action of pull by a homogeneous triaxial ellipsoid, little differing from a sphere of equal volume. The ellipsoid rotates uniformly around one of its axes of symmetry.

The equations of motion in rotating coordinates admit the Jacobi integral. The surface of zero velocity contains three planes of symmetry coinciding with the planes of the coordinates. There are four points of libration situated on the continuation of the equatorial axes of the ellipsoid symmetrically with respect to the origin of coordinates.

It is demonstrated by the method of Poincare that periodic solutions of the third kind exist in the case when $n : n' = 1 : 1$ or $1 : 2$, where n is the mean motion of the particle and n' is the angular velocity of rotation of the ellipsoid. The conditions of existence of circular generating solutions are investigated. The relation between the parameter α , characterizing the shape of the ellipsoid, and the inclination of the generating circular solutions is found. For the quantities $n : n' = 2 : i$ ($i = 5, 6, \dots$) being commensurable, the inclinations of the generating solutions should be close to $63^{\circ}26'06''$ or its complement to 180° .

Solutions of the second kind are always commensurable.

Solutions of the first kind exist at all n and n' , except $n = n'$ and $n/n' = (1 + k)/k$, $k = \pm 1, \pm 2, \dots$. The case $n' = 0$ is dubious.

The author remarks that the results obtained hold also if the gravitating ellipsoid is not homogeneous, but the distribution of its layers is homothetic.

II. BIOLOGY

Microbiology

3. Work on Fluorescent Antibodies Reviewed

"The Contemporary Status of the Problem of the Use of Fluorescent Antibodies," by L. M. Ginodman, Voprosy Virusologii, Vol 2, No 4, Jul/Aug 57, pp 195-200

The article surveys non-USSR work on fluorescent antibodies, including methods of preparation, uses for observing bacterial and viral antigens, and application for studying the distribution of protein antigens and antibodies. The Russian source contained in the bibliography is apparently a translation from English.

Plant Physiology

4. Plant Development in the Far North Studied

"Plant Development in the Far North," by A. A. Shakhov, Institute of Plant Physiology imeni K. A. Timiryazev, Academy of Sciences USSR, Zhurnal Obshchey Biologii, Vol 18, No 5, Sep/Oct 57, pp 338-349

It has been found that in developing plants in the Arctic, the reproductive period proceeding during long days at lowered temperatures is the factor determining the grade of plant precocity. Experiments on different varieties of wheat indicate that conditions preceding reproduction have a great significance on embryogenesis and therefore on the development of succeeding crops. Plants exposed to lowered temperature, particularly at night, during their reproduction period, often undergo vernalization during embryogenesis. This may be partly the cause of the precocity of northern varieties of cereals.

5. Cytophysiological Peculiarities of Yeast Organisms After Deep Refrigeration and Thawing

"Cytophysiological Peculiarities of Yeast Organisms Following Deep Refrigeration and Thawing," by I. M. Udel'nova, Institute of Microbiology, Academy of Sciences USSR, Zhurnal Obshchey Biologii, Vol 18, No 5, Sep/Oct 57, pp 395-401

The present research is a study of the morphological changes in yeast, *Endomyces magnusii*, caused by refrigeration and thawing, and using luminescent microscope and phase contrast.

Results indicate that yeast endurance of low temperature depends on moisture content. Partial dehydration of yeast in a 5% sodium chloride solution and preliminary drying in a thermostat at 30°C significantly increase its viability after refrigeration. Resistance toward deep refrigeration depends on the age of the culture. Under experimental conditions, the duration of low temperature had no effect on the viability of yeast cells. Cell reaction, after refrigeration, exhibited sufficiently energetic respiration.

The contradiction between intensity of oxygen absorption and percentage of viable cells indicates either increased oxygen absorption by the living cells or maintenance of respiratory function by cells that have been injured and are incapable of growth.

6. Purine and Pyrimidine Bases Exert Positive Growth Effect on Oat Coleoptiles

"Nucleic Acid Components as Growth (-Promoting) Substances," by D. A. Sabinin (deceased) and L. Ya. Polozova, Institute of Forestry, Academy of Sciences USSR, Fiziologiya Rasteniy, Vol 4, No 1, Jan/Feb 57, pp 38-43

"A positive effect of purine and pyrimidine bases on the growth of oat coleoptiles was observed. It is suggested that this effect is associated with the incorporation of the bases into the nucleic acid molecule." -- English abstract

7. Use of Algae as Food Source Investigated

"Comparative Biochemical Analysis of Two Species of Green Algae," by G. P. Serenkov, M. V. Pakhomova, and I. G. Borisov, Vestnik Moskovskogo Universiteta, Seriya Biologii, Pochvovedeniya, Geologii, Geografii, No 3, 1957, pp 77-85

The authors report the results of biochemical analysis of two species of green algae: *Scenedesmus acuminatus* and *Enteromorpha intestinalis*. These two species of green algae are sources of food supply for many invertebrates. *Scenedesmus acuminatus* algae belong to the order of Protococcaceae and resemble the Diatomaceae family of algae and many species of bacteria. This species of algae contain large quantities of protein and nucleic acid, but very little carbohydrates. Since the Protococcaceae order of green algae, particularly those belonging to the genus *Chlorella*, contain such large quantities of protein substances, they can be utilized very well as sources of food supply. *Enteromorpha intestinalis* algae belong to the family of Ulvaceae of the order of Ulotrichales and contain a small quantity of protein and very little nucleic acid. *Enteromorpha intestinalis* algae contain up to 25% carbohydrates, mainly polysaccharides of the hemicellulose type. Hemicellulose of this species of algae consists of pentosans and hexosans. This species of algae also contains large quantities of sulfur in a form of sulfuric acid bound with carbohydrate complex. The carbohydrate complex consists of dozens of sugars, including galactose, glucose, mannose, xylose, ribose, rhamnose, and possibly tyvelose. By its chemical composition *Enteromorpha intestinalis* resembles some larger species of algae.

Entomology

[See Items No 72 and 90.]

Radiobiology

8. Synthesis and Accumulation of Pantothenic Acid and Coenzyme A Altered by Various Doses of X Rays

"The Influence of X Rays on the Synthesis and Accumulation of Pantothenic Acid by Yeast Organisms," by L. A. Seliverstova, Institute of Microbiology, Academy of Sciences USSR, Zhurnal Obshchey Biologii, Vol 18, No 5, Sep/Oct 57, pp 360-365

Deep changes occur in the synthesis and accumulation of pantothenic acid in succeeding generations of X-irradiated yeast organisms. Immediately after exposure to radiation, significantly more pantothenic acid is secreted by the X-irradiated yeast organisms than by the non-X-irradiated controls. By increasing the X-ray dose, the ability to accumulate pantothenic acid decreases in the following generations of *Saccharomyces cerevisiae*, and the ability to synthesize this vitamin also decreases in succeeding generations of X-irradiated cells of *Torulopsis utilis*.

Profound changes in the synthesis and accumulation of pantothenic acid in X-irradiated cells indicate changes in coenzyme A whose important component is pantothenic acid.

9. Research Proves Uranium Nitrate Increases Quantity and Improves Quality of Cotton Crop

"The Influence of Uranium on the Development and Productivity of Cotton Plants," by A. N. Gyl'akhmedov, Izvestiya Akademii Nauk Azerbaydzhanskoy SSR, No 9, Sep 57, pp 73-81

The author reviews research performed on the effect of minute quantities of radioactive isotopes (uranium, radium, thorium, etc.) on the quantitative and qualitative yields of plants such as peas, flax, clover, cucumbers, and carrots. The author's main interest was the effect of uranium on cotton yield. Various graphs accompany the article.

The author draws the following conclusions:

1. Uranium aids in increasing the yield of cotton-wool 17-28% under vegetative conditions and 6-19% under field conditions, and best effects on quality and quantity resulted from using uranium nitrate in doses of 15.6 mg/kg of soil and 1.5 mg/kg of soil, respectively.

2. Uranium has a positive effect on both the vegetative and reproductive organs of the cotton plant, and improves cotton quality.
3. Natural uranium nitrate used in small quantities intensifies the process of nitrification, while larger quantities inhibit it.
4. Under the effect of uranium, nitrification changes its seasonal dynamics.
5. Further research is recommended for studying the effect of natural and artificial radioactive substances on cotton, because of its great practical and theoretical value.

10. Ionizing Radiation Most Deleterious to Placental Barrier During First Half of Pregnancy

"The Problem of the Effect of X Rays on the State of the Placental Barrier at Various Periods of Pregnancy," by L. D. Luk'yanova, Institute of Biological Physics, Academy of Sciences USSR, Doklady Akademii Nauk SSSR, Vol 114, No 6, 21 Jun 57, pp 1217-1219

The effect of radioactive phosphorus (P^{32}) was studied on 75 pregnant rabbits, irradiated by 1,000 r, at various stages (15, 20, 25, and 29 days) of pregnancy.

Results indicate that such irradiation produces profound disturbances in phosphorus metabolism between mother and fetus, and that the disturbances are most pronounced when irradiation occurs during the first half of pregnancy.

The author concludes that the shifts caused by the effect of ionizing radiation on animals may have a number of causes, such as changes in permeability of placental barrier, changes in the capacity of the fetus to retain phosphorus in the form of complex compounds, changes in the secretory activity of the placenta itself, and, finally, hemodynamic disturbances.

11. Gamma Rays Alter Plant Growth

"Physiological Changes in Plants Following Delay of Their Growth Due to Gamma Rays," by Yu. V. Rakitin and A. V. Krylov, Institute of Plant Physiology imeni K. A. Timiryazeva, Academy of Sciences USSR, Moscow, Fiziologiya Rasteniy, Vol 4, No 1, Jan/Feb 57, pp 82-85

CPYRGHT

"It is shown that gamma irradiation produces a temporary increase in respiration of potato tubers, sugar-beet roots, carrots, and onion bulbs. After a subsequent decrease, the respiration of the treated specimens is the same as that of the control ones which had not sprouted. Respiration of the control objects sharply increases during sprouting.

"The optimum dose (in the sense of inhibiting sprouting and retaining quality) is 1,000 r for each of potato tubers, beet roots, and onions." -- English abstract.

CPYRGHT

12. Effect of Radioisotopes on the Activity of Catalase and Peroxidase Enzymes in Plants

"Effect of Radioisotopes on the Activity of Catalase and Peroxidase Enzymes," by N. B. Vezirova, Uchenyye Zapiski Azerbaydzhanskogo Gosudarstvennogo Universiteta imeni S. M. Kirova, (Scientific Notes of the Azerbaydzhan State University imeni S. M. Kirov), No 1, 1957, pp 99-106

Because of the importance of determining the effect of radioactivity, itself, on physiological processes of plants and animals where radioisotopes are used as tracers in the study of various processes, a detailed investigation was made of the effect of various doses of isotopes on the activity of catalase and peroxidase in the leaves of the tomato, eggplant, cotton, and corn.

It was found that the effect of radioisotopes on catalase activity was dependent on the age of the plant. On treating the soil with radioactive phosphorus, the maximum increase in activity was observed at the end of 14 days. At later stages of development, the activity of catalase in the leaves decreases. Treating the seeds with large doses of radioactive phosphorus and iron increases the activity of peroxidase in the leaves.

13. Use of Nuclear Power in Agriculture and Forestry in Yugoslavia

"Use of Nuclear Power in Agriculture and Forestry," by
Engr Salko Djikic, Sarajevo, Oslobodjenje, 6 Dec 57, p 4

The Center for Application of Radioactive Isotopes in Agriculture and Forestry (Centar za primjenu radioaktivnih izotopa u poljoprivredi i sumarstvu) was recently established at the Faculty of Agriculture and Forestry in Sarajevo. According to the agreement made with the Federal Commission for Nuclear Research, the faculty will organize research and work on the application of radioactive isotopes in agriculture and forestry through this center. All the faculty's establishments concerned, such as its farming, fruit culture, forestry, livestock breeding, plant protection, and forest protection bureaus (zavod), and their laboratories will engage in this work. To enable the center to begin its work, the faculty has taken measures for the training of professional personnel at home and abroad.

Through such research, methods of nourishing plants, domestic animals, and rapidly maturing trees will be discovered. The center should also study the following:

1. Testing of soil and determining the relation between soil and cultured plants.
2. Studying the physiology of cultured plants and the most valuable types of trees.
3. Studying the physiology of domestic animals.
4. Studying the biology of various agricultural and forest pests, including insects, fungi, bacteria, and viruses for the purpose of eliminating them.

III. CHEMISTRY

Analytical Chemistry

14. Spectroanalytical Determination of Plutonium by the Evaporation Method

"Spectral Analysis by the Evaporation Method; Part 5 -- Analysis of Plutonium by the Method of Evaporation in Vacuum," by A. N. Zaydel', N. I. Kaliteyevskiy, L. V. Lipis, and V. M. Tarakanov, Optika i Spektroskopiya, Vol 3, No 1, Jul 57, pp 16-20

Work is described which involved a preliminary investigation of the spectrum of plutonium and of the volatility of plutonium dioxide. The applicability of the vacuum evaporation method for the determination of small quantities of impurities in plutonium has been established. The precision and sensitivity of the analysis of plutonium for these impurities were found to correspond to those attained in the case of the analogous substance ThO_2 . It was established that synthetic mixtures based on ThO_2 can be used as standards in the analysis of PuO_2 .

The data obtained in the case of plutonium are compared with results described in earlier publications which deal with the analysis of thorium, uranium, zirconium, and beryllium by the same method.

Chemistry of High-Molecular Substances

15. Tenth All-Union Conference on High-Molecular Substances

"News" (unsigned article), Moscow, Kolloidnyy Zhurnal, No 4, Jul/Aug 57, outside back cover

The Tenth All-Union Conference on High-Molecular Substances will be held in Moscow in January 1958. The conference will be devoted to the chemistry and physics of biologically active polymers and proteins. The basic subdivisions of the conference will be on proteins, nucleic acids, polysaccharides, and antibiotic polymers. The conference is to be sponsored by the Chemistry Department of the Academy of Sciences USSR.

Geochemistry

16. The Occurrence and Behavior of Uranium in Sea Water

"On the Conditions of the Occurrence of Uranium in Oceanic Water," by I. Ye. Starik and L. B. Kolyadin, Radium Institute, Academy of Sciences USSR, Geokhimiya, No 3, Jun 57, pp 204-213

The adsorption on glass, cationites, and anionites as well as the ultrafiltration and electrophoresis of hexavalent uranium in oceanic water and in solutions containing $2-50 \times 10^{-6}$ g of U per liter 0.1 g of U per liter have been studied. The investigation has been carried out in the interval of $p_H = 2-10$. The following conclusions on the forms of uranium occurrence in oceanic water at different p_H values were drawn from the data obtained:

1. When the content of carbonate ion in oceanic water is higher than $n \cdot 10^{-6}N$ (at $p_H = 7.5$ and $p \text{ CO}_2 = 5 \times 10^{-4}$ at), uranium occurs in the oceanic water in the form of the $[UO_2(CO_3)_3]^{4-}$ complex. When present in this state, it is not capable of being deposited in significant quantities in bottom sediments.

2. When the content of the carbonate ion is lower than $n \cdot 10^{-6}N$ (at the same p_H and the same carbon dioxide pressure), the uranium occurs in oceanic water in the form of hydrolysis products adsorbed on colloidal silicate particles. It is then deposited on the bottom of the ocean at a rate which depends on the rate of sedimentation of the colloidal particles.

3. At eH values lower than approximately minus 0.1 V, the uranium contained in oceanic water can be reduced to a quadrivalent state. When present in this state it is deposited very rapidly in the bottom sediments.

[SIR Note: The results obtained in this investigation, in addition to being of interest from the standpoint of the geochemistry of uranium and prospecting for deposits of this element, form a contribution to knowledge of the chemical behavior of uranium in dilute solutions, its tendency to form complexes under different conditions, and its capacity to be adsorbed on ion-exchangers.]

Industrial Chemistry

17. Developments in Rocket and Jet Fuels

Motornyye Topliva, Masla, i Zhidkosti (Motor Fuels, Oils, and Liquids) edited by Prof K. K. Papok, Doctor of Technical Sciences, and Prof Ye. G. Semenido, Doctor of Technical Sciences, Vol I (Motor Fuels), 3d edition, Gostoptekhizdat, Moscow, 1957, 512 pp

The following information on jet and rocket fuels is given in the book under the headings indicated.

Types of Fuels for Jet Engines

Present-day jet engines operate on different types of fuels. The fuels for jets are derived from petroleum and from products of the conversion of solid fuels. As far as classification according to methods of production is concerned, petroleum fuels for jets are subdivided into straight-run products and products of thermal and catalytic cracking. As far as their fractional composition is concerned, the fuels are subdivided into those of the gasoline type, ligroin type, kerosene type, gas oil type, and broad fraction type. The technical standards for these fuels are listed in Table 114, pp 324-325. Fuels of the gasoline type are used primarily for ram and pulse jets as well as for the engines of naval aircraft by means of which military operations are conducted from carriers. Straight-run fuels of the kerosene type are used primarily for turbocompressor jets. The principal advantages of fuels of the latter type are a low temperature of crystallization, a high heat of combustion per unit of volume, a low vapor pressure, and relative safety as far as the danger of fires is concerned.

Fuels of the gas oil type are also used for jet engines. Gas oil fuels are inferior to kerosene in quality. Gas oil fuels have a high temperature of congelation and relatively inferior combustion characteristics. However, the heat of combustion referred to a unit volume is higher in the case of gas oil than of kerosene. Tests of the fuels mentioned above, which have been made during the period 1945-1949 on stationary engines under conditions prevalent in the summer, have shown that these fuels have substantial drawbacks, particularly as far as stability of combustion and reignition during flight at high altitudes is concerned. Furthermore, the available supply of these fuels is limited, because their yield does not exceed 10-15% of the total quantity of petroleum that has been converted. Accordingly, the period from 1949 to 1953 is characterized by the appearance of fuels of a broad fractional composition which are obtained by blending gasoline, ligroin, and kerosene fractions and to some extent the gas oil fraction of petroleum.

When fuels of this type are used, the shortcomings mentioned above are eliminated. However, tests made under conditions prevalent in the summer demonstrated that the gasoline fractions evaporate at high altitudes and that the advantages which the fuels possess due to the presence of these fractions then disappear. It was established that introduction of low-boiling components into jet fuels is permissible in such quantities only that the vapor pressure of the fuel does not exceed 150 mm of mercury. Fuels with this vapor pressure do not differ to any marked extent from those of the kerosene type. Judging from the technical standard for turbojet fuels which have appeared lately, there is a return to fuels of the kerosene type. For engines of aircraft which fly at supersonic speed, heavier fuels of the gas oil type have been developed.

Because of the shortage of supply of straight-run jet fuels, the period after World War II is characterized by the appearance of fuels in which components obtained by thermal and catalytic cracking are included.

Special starting fuels are used for some types of jet engines. Products which evaporate well (e.g., aviation gasolines of the B-70 and B-78 types) are used as starting fuels.

The requirements for jet fuels to be used in civil aviation are somewhat different from those put to military aviation fuels. For instance, the principal requirements which jet fuels used in civil aviation must fulfill are safety with regard to fires, low cost, and availability in sufficient quantities.

The crystallization point of jet fuels used in civil aviation does not have to be as low as minus 60° : a temperature of congelation equal to minus 40° is sufficient. (pp 323-327)

The Chemical Composition of Fuels for Jet Engines

Fuels for jet engines consist of petroleum fractions which boil within the range of 65-350°, i.e., the gasoline, ligroin, and kerosene fractions. In supersonic aircraft the gas-oil fraction is also used.

The chemical composition exerts a considerable influence on the operational characteristics of jet fuels. Some classes of hydrocarbons, such as aromatic, normal paraffinic, and unsaturated hydrocarbons, have a harmful effect on the operation of engines when they are used as fuel. A high content of aromatic hydrocarbons increases the tendency of the fuel to deposit carbon, normal paraffinic hydrocarbons raise the temperature of congelation, while unsaturated hydrocarbons lower the stability of the fuel under conditions encountered in operation and during storage. For the reasons stated, jet fuels should not

contain more than 20-25% of aromatic hydrocarbons or more than 25-30% of unsaturated hydrocarbons, while the content of normal paraffinic hydrocarbons is limited by the necessity of having a low temperature of congelation which does not exceed minus 40 to minus 60°.

Accordingly, in present-day jet fuels of the T-1, TS-1, and T-2 types the content of aromatic hydrocarbon comprises 15-20% and should not exceed the standard which has been set. The content of isoparaffins comprises 30-60% and that of naphthenes 20-45%. The proportion between aromatic, paraffinic, and naphthenic hydrocarbons, present in quantities not exceeding the limits indicated above, depends on the nature of the petroleum which has been converted. The content of unsaturated hydrocarbons in jet fuels varies from 1% to 20%. In straight-run fuels the content of unsaturated hydrocarbons is low (1-3%) while in fuels which contain cracked components the content of unsaturated hydrocarbons may be as high as 20%. (pp 327-328)

Trends in the Development of Fuels for Jet Engines

The rapid development of jet-propelled aviation puts new requirements to fuels for reaction engines. The present stage of development in the field of jet-propelled aviation can be characterized as a transition from subsonic and near-sonic aircraft to aircraft flying at supersonic velocities. Accordingly, the tasks to be fulfilled in the development of jet fuels are also of a transitional type in the sense that new fuels for supersonic aircraft must be created while work on fuels for subsonic aircraft has not yet been fully terminated. This means that work must be conducted on both types of fuel. The reason is that, although military aviation is in a state of transition to supersonic aircraft, civil aviation still relies chiefly on subsonic planes.

Notwithstanding the work of a decade on fuels for subsonic jet-propelled aircraft, important problems in this field must still be solved. Among these problems are the following:

- a. Achievement of a higher volume heat of combustion.
- b. Increase in the rate of combustion.
- c. Reduction of the tendency of fuels of the kerosene type to become saturated with air under conditions encountered during flight to higher altitudes.
- d. Extension of the selection of additives which prevent the formation of ice at low temperatures.
- e. Lowering of the corrosive effect of fuels which contain sulfur, particularly of fuels that have a high content of active components (mercaptanes and sulfur).

f. Prevention of the corrosion of steel parts of the engine's fuel system under the effect of water contained in the fuel.

g. Development of additives which increase the stability in storage of fuels of a broad fractional composition.

h. Prevention of the formation in fuels during storage of precipitates which consist of soaps of organic acids.

i. Lowering of the crystallization temperature of fuels of the kerosene type.

An increase in the volume heat of combustion is of decisive importance from the standpoint of extension of the range of jet-propelled aircraft.

It has been established that under operational conditions a change of the volume heat of combustion by 400 kilocalories per kilogram results in a change in the range of the aircraft, which depending on its design varies between 6-11%. The volume heat of combustion of present-day jet fuels can be increased by the following means:

a. Appropriate selection of crudes and of petroleum fractions with the necessary heat of combustion.

b. Raising the content of aromatic hydrocarbons, which have a very high volume heat of combustion.

c. Organization of the industrial production of synthetic fuel components which should be high-molecular isoparaffines with closely spaced side-chains.

The first stage in the subsequent development should be application as jet fuels of high-boiling petroleum distillation products with a high volume heat of combustion, i.e., use of fuels of the diesel or gas oil type. Application of such fuels would make it possible to increase the range of aircraft 15%. However, jet engines operating on this type of fuel shall presumably not be available within the next 10 years.

A considerably better performance can be obtained by increasing the content of aromatic hydrocarbons, particularly of 2-ring hydrocarbons. The volume heat of combustion of these hydrocarbons is approximately 1,000 kilocalories per kg higher than that of the jet fuels available at present. By using the new type of fuels an increase in the range amounting to 25% can be achieved. However, before this problem is solved, work must be done on increasing the degree and rate of combustion as well as lowering the tendency of fuels which contain aromatic hydrocarbons to deposit carbon.

As far as improvement in the rate of combustion is concerned, one must increase the selection of additives which speed up combustion. Furthermore, the number of additives which prevent the formation of ice in fuels and of additives that lower the corrosive effect produced by fuels as well as their tendency to form resins and sediments must be increased.

If it were possible to develop additives which lower the corrosive action of the fuel toward nonferrous metals, kerosene that contains a considerable amount of active sulfur compounds could be used. The amount of available jet fuel would be considerably increased thereby.

While reduction of the content of active sulfur compounds in fuels can be accomplished by applying expensive technologic procedures, reduction of the corrosion due to the action of water is possible by one means only, namely, by developing appropriate additives. This is due to the fact that jet fuels rapidly absorb moisture from the surrounding air during transportation and storage, so that drying of the fuels at the plant will be of no avail.

Lowering of the temperature of crystallization of fuels is of great importance from the standpoint of increasing the supply of fuels available for use in jets. This problem cannot be solved by developing appropriate additives. The best way of solving it is by the application of technological procedures such as carbamide purification and percolation through activated carbon. Work on the application of the carbamide method of purification showed from the very beginning that it is possible to lower the temperature of crystallization of jet fuels considerably by this method. At present, this method is regarded as promising from this standpoint.

The problem of jet fuels became very acute in connection with the transition to supersonic velocities. In supersonic flight the aerodynamic heating of the shell of the aircraft brings about heating of the fuel. The degree to which this heating proceeds depends on the velocity of the aircraft. At velocities corresponding to Mach 1.5 the temperature of the fuel system of the engine reaches 100-120° while at Mach 2.5 it amounts to 200-220°. In addition to the heating due to the aerodynamic increase in temperature, the fuel is also heated because it is used as a coolant for the lubricating oil and for some parts of the aircraft in supersonic flight.

Under these conditions, even the most stable straight-run fuels are subjected to intensive oxidation which leads to the formation of solid resinous sediments that clog the fuel system of the engine. It is obvious at present that as far as the production of thermostable fuels for supersonic aircraft is concerned, the most promising approach is not by the application of technological methods for processing the fuel but through the development of additives which increase the heat stability. (pp 386-389)

Ways of Improving Rocket Fuels

Two of the most important indices of the quality of fuels are the heat of combustion and the specific weight. Attempts to improve the quality of fuels as far as these indices are concerned resulted in the proposal that certain metals be used as fuels or as fuel components.

The idea of using metal fuels for rockets was first suggested by G. A. Tsander. Later Yu. V. Kondratyuk, G. E. Langemak, and V. P. Glushko made calculations which showed that it is possible to use as fuel magnesium, aluminum, boron, lithium, silicon, and beryllium as well as some metal hydrides and organometallic compounds.

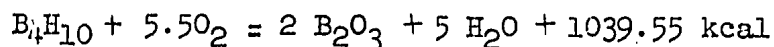
The metals which have been enumerated have higher heats of combustion (3,500-5,600 kilocalories per kilogram in mixtures with oxidants) and higher densities (1.73-2.70 grams per cubic centimeter) than other types of fuel.

The use of metals in a molten state or a state of fine dispersion presents considerable difficulties. Metals are not used in this manner at present.

Metals combined with hydrocarbon fuels can be applied in the form of colloidal solutions, in which the dispersed phase is formed by the finely subdivided metal and the continuous phase by the hydrocarbon fuel. Another possibility is the use of a solution of an organometallic compound in the fuel.

V. P. Glushko proposed to use as fuels organometallic compounds of boron and beryllium, which are liquid under normal conditions. Among compounds considered, some of the boranes appear to be most suitable.

A high temperature of combustion is characteristic for boranes. For instance, the heat of combustion of B_4H_{10} corresponds to the following equation



The molar heat of combustion given in this equation corresponds to 19,840 kilocalories per kilogram.

A stoichiometric mixture of B_4H_{10} with oxygen yields 4,530 kilocalories per kilogram or 4,165 kilocalories per liter. Boranes have received considerable attention on the part of many investigators because of their high heat of combustion. It is known that boron hydrides have been tested by the General Electric Company at test stands of the ordnance supply service experimental station at the Island of Malta.

One of the drawbacks of boranes is the high toxicity of these compounds. Some of the compounds of this class ignite on coming in contact with the air.

The addition of metals to hydrocarbon fuels makes it possible to increase considerably the heat of combustion of such fuels both per unit of weight and per unit of volume. The table which follows (Table 161, page 427) indicates the effect of additions of metallic beryllium on the heat of combustion of a propellant mixture consisting of kerosene and nitric acid. The data listed in the table have been published by G. E. Langemak and V. P. Glushko.

CPYRGHT

Effect of the Addition of Be on the Heat of Combustion
Mixture of Kerosene with Nitric Acid.

<u>Fuel</u>	Heat of Combustion (in		Increase in % of the Heat of Combustion per Unit of Volume
	<u>kcal/kg</u>	<u>kcal/l</u>	
Kerosene + nitric acid	1,440	1,920	--
" + " +3.6% Be	1,790	2,430	26.6
" + " +7.2% Be	2,130	2,960	54.1
" + " +10% Be	2,480	3,520	83.3

The effect of the ignition delay on the reliability and steadiness of the operation of rocket engines has been discussed earlier (see pages 398-399). It was shown that the length of the period of ignition delay of fuels exerts an effect on the facility and smoothness with which the engine can be started, the stability of the operation of the engine, the lack of pulsation in operation, and the completeness of combustion of the fuel.

All the parameters mentioned are improved when the ignition delay is short.

Investigations which have been made demonstrated that it is possible to shorten the ignition delay by adding special substances which act as initiators and catalysts of ignition. As such initiators and catalysts, potassium cuprocyanide, iron dibutyl-naphthylsulfonate, iron nitrate, and some peroxides, nitrites, and nitrates derived from hydrocarbons as well as other substances can be used for fuels having certain compositions. Data by D. P. Mullins (Fuel, Vol 32, 1953, No 3, p 327; No 4, p 451, 1953) illustrate the effect of peroxides and nitrates

on the period of delay of ignition. These data are presented in Figures 164, p 427, and 165, p 428, in the form of curves showing the effects of tert-butyl hydroperoxide and ethyl nitrate on kerosene-air mixtures. When peroxides or nitrates have been added, the energy of activation of the ignition is lowered.

The effectiveness of additives depends on the composition of fuel mixtures and on the particular fuel and oxidant which enter into this composition. The appropriate choice of additives which lower the period of ignition delay most effectively for any given fuel composition is also a means of improving the quality of rocket fuels.

By selecting appropriate additives one may improve some operational characteristics of the fuel such as the concentration limits of combustion and formation of carbon. (pp 425-428).

Propellant Mixtures Used in Rocket Engines

The rocket engines which have been actually manufactured on a production basis up to now are as a rule based on the employment of bicomponent fuels, which according to the method of ignition are subdivided into self-igniting fuels and fuels which have to be ignited.

When some fuels and oxidants come into mutual contact, a chemical action results that evolves a quantity of heat sufficient for the ignition of the mixture. The most common oxidants in self-igniting fuels are nitric acid and hydrogen peroxide.

The use of nitric acid makes it possible to obtain self-igniting fuels in which the combustible component is an amine, pyrocatechol, hydroquinone, an unsaturated hydrocarbon, or ether (e.g., vinylacetylene, furan, furfuryl alcohol, etc.). These substances can be used as fuels or as admixtures to fuels which do not ignite on contact with nitric acid. In the latter case the substance which initiates the ignition is added to the principal fuel, which acts as a solvent. The quantity of substance which is added must be sufficient to assure ignition of the mixture on contact of the fuel with the oxidant.

In order that substances which initiate ignition may be added to them, the fuels must satisfy the following conditions:

- a. The principal fuel must readily dissolve within a wide temperature range the substance that initiates ignition.
- b. The ignition delay of the mixture must be such that the starting is easy and that steady operation of the engine is assured.

As solvents for initiating substances one may use methyl or ethyl alcohol, benzene, xylene, tetrahydrofuran, furfural, chlorinated hydrocarbons, and other substances.

As substances which initiate the ignition of the fuel, special ignition catalysts are also used. These catalysts are usually dissolved in the principal constituent of the fuel. As has been mentioned already, potassium cuprocyanide, the salts of sulfonic acids (for instance, iron dibutyl-naphthylsulfonate), and other substances may serve as such catalysts.

Ignition of propellant mixtures in cases when hydrogen peroxide is used as the oxidant is achieved by the application of substances which catalyze the decomposition of hydrogen peroxide. The high temperature of the products of this decomposition ($400-500^{\circ}$) assures the ignition of many substances used as fuels. Substances initiating the ignition and catalysts which promote the ignition can also be used in this case.

Table 162 (page 430) lists the composition of fuel combinations used in rockets operating on self-igniting fuel. [Bicomponent fuel combinations that have been used in German, British, Swiss, and American rockets are listed in this table. The hydrogen peroxide-decalin combination which has been used in German torpedoes is also listed.]

A great number of combinations can be used as bicomponent fuels that have to be ignited. The limitations which restrict the selection of self-igniting fuels do not apply in this case.

The mixture of the fuel with the oxidant does not have to ignite in this case after the two components come into contact. Accordingly, the selection of substances that can be used as fuels and oxidants for rockets is considerably increased, so that the most efficient fuel compositions can be applied.

One of the advantages of fuels which do not ignite spontaneously is the reduction of the danger of fire. In the case of spillage of the fuel and oxidant, contact between them does not result in a fire unless there is a source of ignition.

The number of fuel compositions that have to be ignited is unlimited for all practical purposes. Table 163 (page 431) lists some bicomponent fuel combinations which must be ignited and which have already been applied. [Table 163 lists five fuel-oxidant combinations that have been used in German, American, Swiss, French and British rockets.] (pages 428-431)

Fuels of the Future

The problem of achieving great distances in the flight of rockets necessitates the search for new sources of power based on the utilization of chemical, nuclear, and thermonuclear fuels.

Table 164 (page 432) gives a comparison of the calorie output of chemical, nuclear, and thermonuclear fuels.

In recent times work has been conducted in a number of countries on the development of rocket engines which utilize nuclear energy.

The following methods of using nuclear energy in rocket engines have been proposed:

a. The nuclear energy that is evolved is transferred to a heat carrier, i.e., water or liquid hydrogen, with the result that the latter is transformed into vapor or gas. The vapor that has been heated to a high temperature is ejected from the nozzle of the engine. Under the circumstances one can heat the fuel to temperatures at which the heat carrier is dissociated into atoms. These atoms on recombining evolve a very large quantity of heat, so that very high velocities of outflow from the nozzle are achieved.

b. Another possibility is direct utilization of the kinetic energy of radiation produced in nuclear chain reactions. It has been calculated that in this case production of a thrust amounting to one ton per second requires 0.00152 kilogram of uranium —235. Four and a half kilograms of chemical fuel would be required to produce this thrust.

A number of complex technical problems will have to be solved before nuclear energy is used directly in rocket engines. Among these problems one may mention cooling of the engine and prevention of the contamination of the atmosphere with radioactive particles. The first way, that of utilizing nuclear energy in combination with a heat carrier, is much nearer actual application. Employment of nuclear energy in this manner can be expected soon. (pp 431-432)

18. Progress in the Production of Metals by the Electrolysis of Melts

"Hundred and Fifty Years of the Electrolysis of Melts,"
by A. I. Belyayev, Uspekhi Khimii, Vol 26, No 10, Oct 57,
pp 1180-1186

Progress in the development and application of methods for the production of metals by the electrolysis of salt melts and molten salt-oxide mixtures is reviewed with particular attention to Russian and USSR work. Forty-one references, 33 among them Russian, are listed in the bibliography. Production of high-melting metals, electrolytic plating with refractory metals, and production by electrolysis of refractory metals in a powdered state are discussed. It is pointed out that Li, Be, Na, Mg, Al, K, Ca, the lanthanides, Ta, and Th are produced by the electrolysis of melts and that B, Ti, Mn, Fe, Co, Ni, Cu, Zn, As, Rb, Sr, Zr, Nb, Mo, Ag, Cd, Sn, Sb, Cs, Ba, W, Pb, and U can also be separated in this manner.

19. New Yugoslav Method of Quenching Coke

"New Process for Quenching Coke," by Dusan Isakovic,
Belgrade, Borba, 15 Dec 57, p 3

Engr Dragoljub Beatovic of the Lukavac Cokery has proposed and experimentally tested a new method of quenching coke. Instead of being quenched with water, the coke is quenched with powdered coal in airtight chambers. The powdered coal absorbs the heat from the hot coke, and, in the ensuing distillation process, low-temperature coke is produced from the powdered coal along with liquid and gaseous distillation products. The process saves large quantities of water and produces valuable products from fine coal which otherwise is not suitable for coking. Beatovic has designed a reactor for this technological process as well as supplementary equipment for converting existing cokerries to this method.

20. Fourth Conference of Silicate Industry Research Workers in Hungary

"IV Conference of Silicate Industry Scientists"
(unsigned article), Budapest, Nepszabadsag, 4 Dec 57, p 2

The Technical Sciences Department of the Hungarian Academy of Sciences (Magyar Tudomanyos Akademia) and the Scientific Association of the Construction Materials Industry (Epitoanyagipari Tudomanyos Egyesulet) arranged the fourth conference of the silicate industry research workers held from 5 to 7 December 1957 in the halls of the academy. Lectures at the conference included Kitaygorodskiy (fnu), Soviet academician; Budnikov (fnu), Soviet Academician; Lur'ye (fnu), Soviet professor; M. Gregor, Czechoslovak academician; Figus (fnu), Czechoslovak professor; Franke (fnu), professor from Weimar; and Professor Winogradow (fnu) from Poland.

Organic Chemistry

[See Items No 91 and 113.]

Inorganic Chemistry

21. The Decomposition of Nitric Acid

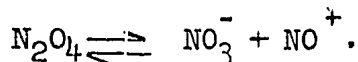
"Spectroscopic Investigation of HNO_3 - N_2O_4 - H_2O Solutions,"
by T. V. Yakovleva, State Institute of Applied Chemistry,
Zhurnal Neorganicheskoy Khimii, Vol 2, No 12, Dec 57,
pp 2762-2788

Investigation of the kinetics of the decomposition of nitric acid in the liquid phase proved to be inadequate for the clarification of the mechanism of the decomposition of nitric acid: data on the chemical structure of HNO_3 - N_2O_4 - H_2O solutions were necessary. In the investigation described in this paper, an attempt has been made to obtain these data by studying vibrational spectra.

On the basis of spectroscopic data published in the literature, one may regard the following as established:

1. That anhydrous nitric acid partly dissociates according to the equation $2 \text{HNO}_3 \rightleftharpoons \text{NO}_3^- + \text{NO}_2^+ + \text{H}_2\text{O}$.

2. That in HNO_3 - N_2O_4 solutions containing up to 8.7% of N_2O_4 the nitrogen tetroxide dissociates completely according to the equation



A systematic spectroscopic investigation of HNO_3 - N_2O_4 - H_2O has not yet been made. From the standpoint of the problem that has to be solved, the range of high concentrations of HNO_3 is of particular interest. This is the range which has been investigated.

No special evaluation of the intensity of bands in infrared spectra has been made, so that no relationships can yet be derived on this basis. However, one may assume on the basis of the data which have been obtained that the following relationships exist: at a 2% content of water, the intensity of the 770 and 910 cm^{-1} bands (HNO_3) passes through a maximum, while the intensity of the 1263 cm^{-1} band (N_2O_4) passes through a minimum. The concentration of N_2O_4 also exerts an effect on the intensity of the absorption bands, but more detailed data on the subject are needed. It will be of definite value to make measurements of the changes of intensity in bands of Raman spectra and infrared absorption spectra at different concentrations of the components of HNO_3 - N_2O_4 - H_2O solutions.

[SIR Note: Results obtained in research of this type have a bearing on the behavior of concentrated nitric acid, nitrogen tetroxide, and mixtures of nitric acid with nitrogen tetroxide in storage and transportation.]

22. Activated Carbon Applied in Work With Diborane and Boron Trichloride

"On the Application of Activated Carbon in Practical Work With Diborane and Boron Trichloride," by V. I. Mikheyeva and T. N. Dymova, Zhurnal Neorganicheskoy Khimii, Vol 2, No 11, Nov 57, pp 2539-2542

Because of the toxicity of volatile boron compounds, specifically of diborane and boron trichloride, and the danger of explosions when these compounds come into contact with moist air, their escape into the air must be prevented. Traps filled with activated carbon were found to be of advantage for this purpose. The use of such traps opens up possibilities of investigating the kinetics of reactions accompanied by the evolution of diborane or of boron trichloride and of determining at atmospheric pressure, without the use of vacuum equipment, the boiling points of mixtures that contain diborane or boron trichloride.

23. Preparation of Diborane by the Reduction of Boron Trichloride With Hydrogen

"Investigation of the Interaction of Boron Trichloride With Hydrogen in the Presence of Aluminum or of Some Aluminum Alloys," by V. I. Mikheyeva and T. N. Dymova, Zhurnal Neorganicheskoy Khimii, Vol 2, No 11, Nov 57, pp 2530-2538

Hydrolytic decomposition of borides and reduction of boron halides with hydrogen under the action of an electric discharge are unsatisfactory methods for the preparation of diborane, principally because low yields of diborane are obtained. The reaction of lithium hydride with the boron trifluoride-ethyl ether addition product is unsatisfactory because large quantities of ether have to be employed. From the practical standpoint, reduction of boron trichloride with hydrogen in the presence of metals and hydrides is preferable (cf. D. Hurd, J. Amer. Chem. Soc., Vol 71, 1949, p 20). Although the yields obtained are small, this reaction can be conducted continuously. The possibilities of increasing the yields of diborane in this reaction by using aluminum alloyed with other metals have been studied.

In the experiments conducted, a gaseous mixture of boron trichloride with hydrogen was passed through aluminum alloy powders. It was established that the yield of diborane is improved when alloys of aluminum with transition metals are used. Al-Cu, Al-Cu-Zn, Al-Cu-Li, Al-Cu-Mg, Al-Cu-Ni, Al-Cu-Fe, and Al-Cu-Ce alloys were investigated. Systematic investigation of Al-Cu alloys showed that the dependence between the alloy composition and yield follows the regularities established by N. S. Kurnakov for the interrelationships between the composition of alloys and their mechanical properties. On the example of an alloy of aluminum with 5.3% of copper, the effect of heat-treatment on the chemical activity of metal alloys was confirmed.

[SIR Note: Diborane is of importance as a rocket engine fuel. In addition, it serves as a principal starting material for the preparation of other boranes (e.g., by dehydrogenation) and of their derivatives.]

24. Complex Compounds of Lanthanum With Trioxylglutaric Acid

"On the Complex Compounds of Lanthanum With Trioxylglutaric Acid," by Ya. A. Fialkov and N. K. Davidenko, Zhurnal Neorganicheskoy Khimii, Vol 2, No 11, Nov 57, pp 2562-2569

By using the methods of potentiometric p_H titration, measurement of electric conductivity, and determination of ion transfer numbers, the interaction of lanthanum with trioxylglutaric acid was investigated in a wide p_H range. It was found that in acidic, neutral, and alkaline solutions compounds of lanthanum with trioxylglutaric acid are formed at a proportion of the two components of 1:1. Lanthanum enters into the composition of a complex cation in acidic solutions. In weakly acidic and neutral solutions an insoluble neutral compound is formed, while in alkaline solutions a soluble anionic complex is present. $La_2(C_5H_6O_7)_3$ was isolated from acidic solutions, $C_5H_5O_7La \cdot H_2O$ from weakly acidic solutions, and $C_5H_4O_7LaNa \cdot H_2O$ from alkaline solutions. The presumable structural formulas of these compounds are given.

The complex compounds of aliphatic hydroxycarboxylic acids with rare-earth elements play an important role in the separation of these elements with the aid of ion-exchange resins. Hitherto, citric acid and to some extent lactic acid were mainly used for this purpose.

25. The Chemical Properties of Cerium Hydrides

"On the Chemical Properties of Cerium Hydrides," by M. Ye. Kost, Zhurnal Neorganicheskoy Khimii, Vol 2, No 12, Dec 57, pp 2689-2693

It was found that the difficulties due to the high reactivity of cerium hydrides toward the oxygen of the air can be eliminated to a considerable extent by a brief treatment with carbon dioxide of the cerium hydrides that have been obtained. By analogy with the reaction for the preparation of anhydrous uranium halides, a new method has been developed for the preparation of anhydrous cerium bromide by treating cerium hydride with hydrogen bromide. Investigation of the hydrolysis of cerium hydrides showed that cerium trihydride is more reactive than cerium dihydride and that there is no differential effect [steep drop in the curve] as far as the rate of evolution of hydrogen is concerned.

26. Third Republic Conference on Inorganic Chemistry

"An Announcement" (unsigned article), Kiev, Ukrainskiy Khimicheskiy Zhurnal, Issue 3, 1957, inside front cover

The article reported that the Institute of General and Inorganic Chemistry, Academy of Sciences Ukrainian SSR, would convoke the Third Republic Conference on Inorganic Chemistry in December 1957 in Kiev. It added that the conference would concern the results of chemical research for the past 40 years in the Ukraine, the chemistry and technology of individual elements or groups of elements, mineral resources in the Ukraine, and the structure of inorganic compounds.

Isotope Chemistry

27. Concentration of Sulfur Isotopes by Chemical Exchange

"Application of Radioactive Sulfur for the Investigation of the Process of Concentration of Rare Sulfur Isotopes by a Chemical Exchange Method," by I. A. Korshunov and A. P. Batalov, Chair of Radiochemistry, Gor'kiy State University imeni N. I. Lobachevskiy, Zhurnal Neorganicheskoy Khimii, Vol 2, No 11, Nov 57, pp 2676-2679

The radioactive isotope S^{35} was used for the investigation of the process of concentration of S^{34} by the exchange between sulfur dioxide and sodium bisulfite in a countercurrent column. It was shown that the application of radioactive sulfur makes it possible to determine the dependence of the maximum enrichment achieved on a number of factors such as the concentration of the working solution and the rate at which it is fed into the apparatus.

28. Soviet Professor in Hungary

"News" (unsigned article), Budapest, Nepszabadsag, 4 Dec 57, p 8

O. V. Uvarov, professor at the Khar'kov Physicochemistry Institute, gave a lecture on 3 December 1957 on the separation of stable isotopes of the light elements at the Department of Physics and Chemistry of the Eotvos University in Hungary.

29. "Soyuzreaktiv" Trust Announces Availability of Cobalt-60 and Iridium-192

Moscow, Vechernyaya Moskva, 24 Dec 57

An announcement in this paper says that the "Soyuzreaktiv" Trust has in its possession and is able to deliver in December 1957 and January 1958 the following: cobalt-60 with an activity of 0.5 gram-equivalent of radium and 50 grams-equivalent of radium; and iridium-192 with an activity of 2 grams-equivalent of radium. Orders should be made out in conformance with established regulations. The address of the trust is Tsent, Krivokolenny Per., 12 (Center, Krivokolenny St., 12); telephone K 4-56-43.

[For additional information on isotope chemistry, see Item No 55.]

Nuclear Chemistry

30. The Extraction of Radioactive Ruthenium From Solutions of Irradiated Uranium

"Investigation of the Extraction With Organic Solvents of Ruthenium From Nitric Acid Solutions; Part 1," by V. D. Nikol'skiy and V. S. Shmidt, Zhurnal Neorganicheskoy Khimii, Vol 2, No 12, Dec 57, pp 2746-2751

The distribution of ruthenium tetroxide, the nitrate of quadrivalent ruthenium, and ruthenium nitrosnitrates between nitric acid solutions and diethyl ether, kerosene, and solutions of tributyl phosphate in kerosene was investigated. It was found that only the nitrosnitrates are extracted to a significant extent. Ruthenium tetroxide is unstable in the organic phase.

It was established that there is a close similarity between the behavior of ruthenium present in nitrosnitrate solutions and radioactive ruthenium present in nitric acid solutions of irradiated uranium. This confirms the assumption that the ruthenium which is extractable from solutions of irradiated uranium is present in the form of nitrosnitrates.

[SIR Note: Purification of irradiated uranium from radioactive ruthenium present in it as a fission splinter element is important because of the high cross section of neutron absorption exhibited by this element.]

IV. EARTH SCIENCES

Geodesy

31. Field Editing of Topographic Maps

"Field Editing of Topographic Maps," by M. Teshabayev, Izv. Uzbekist. fil. Vses. geogr. o-va SSSR, 1956, 2 (23), pp 150-154 (from Referativnyy Zhurnal--Astronomiya i Geodeziya, No 8, Aug 57, Abstract No 6917)

Field editing should provide the fullest and most correct reflection of the natural landscape on the map. The editor of a field detachment should study the area, complete editing instructions, supervise the personnel, and compile the topographic description. Detailed geographical descriptions are suggested. Examples of a survey are given.

32. Polar Method of Copying Maps in a Different Scale

"A Polar Method of Copying Maps in a Different Scale," by K. M. Nadelayev, Tr. Irkut, gorno-metallurg. in-ta, 1956, No 10, pp 140-142 (from Referativnyy Zhurnal--Astronomiya i Geodeziya, No 8, Aug 57, Abstract No 6927)

Under conditions of field geodesic survey work the copying of maps and drawings in a different scale by means of a pantograph is not always possible. A polar method of pantographing is suggested in which the picture on wax paper superposed on the pantographed drawing is obtained by changing, by the chosen factor, the radius-vector defining the position of the reproduced point..

33. Fixing Mine Vertical

"The Fixing of Extreme Positions of a Swinging Mine Vertical by Theodolite Reiterating Method," by A. A. Fedorovskiy, Sb. Krivorozhsk. gornorudn. in-ta, 1956, No 5, pp 111-115 (from Referativnyy Zhurnal--Astronomiya i Geodeziya, No 8, Aug 57, Abstract No 6947)

A method is suggested which affords the possibility of bypassing the use of scales in the orientation of underground mapping. It consists in reiteration between the extreme positions of both swinging plumb lines and immobile signals. The latter consist of mine lamps with opaque glass on which the swinging shafts are visible. Special signs are made on these screens. The accuracy is about ± 10 ."

34. Trigonometric Leveling by Percent Method

"Trigonometric Leveling by Percent Method," by Ye. V. Milevskiy, Avtomob. dorogi, 1956, No 8, pp 20-21 (from Referativnyy Zhurnal -- Astronomiya i Geodeziya, No 8, Aug 57, Abstract No 6945)

It is suggested that the producing of tacheometric and plane table maps in large scale be defined by the exceeding of rack points over the station in percentage of distance. Here, because the value of the function $\sin 2\alpha/2$ is a percentage ratio of $n = h/\alpha$, then the known formula $h = (d \sin 2\alpha/2 + i - v)$ may be used in the form $h = dn/100 + i - v$.

Geophysics

35. Variations of Thermobaric Fields in the Free Atmosphere

"24-Hour Variations of Thermobaric Fields in the Free Atmosphere," by A. S. Chaplygina, Tr. Geofiz. in-ta AN SSSR, No 33 (160), pp 60-105 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9144, by V. V. Bykov)

This work gives the results of a statistical investigation of the diurnal variations of the geopotential field for levels of 1,000, 850, 700, 500, and 300 mb. The data are obtained from constant pressure maps by the Central Institute of Forecasts for the periods from 1 to 10 September 1950, 1 to 31 May 1951, and 1 to 31 May 1952. The central portion of European USSR was selected for investigation because it was the most completely covered by aerological observations.

The values of real variations of geopotential, vortices, and relative topography were calculated on standard levels for a number of points in the above-mentioned territory. The indicated values were subjected to a primary statistical processing which consisted of the calculation of the mean square values of diurnal variations of geopotential and vortices at different levels, the relative topography at different layers, the correlation between individual characteristics of the thermobaric field, etc.

One of the basic problems in this work is the determination of the regression coefficients a_i and b_k in the regression equation:

$$Z_{\lambda} = \sum_{i=1}^5 a_i x_i + \sum_{k=1}^4 b_k y_k \quad (i=1, 2, 3, 4, 5),$$

where x_i ($i = 1, 2, 3, 4, 5$) is the advection of the vortex at levels of 1,000, 850, 750, 500, and 300 mb, respectively; y_k ($k = 1, 2, 3, 4$) is the advection of the relative topography (of mean temperature) of the layers between 850 and 1,000, 700 and 850, and 300 and 500, respectively, graphically calculated along the trajectories of air particles and based on the upper boundary levels of each layer; and Z ($l = 1, 2, 3, 4, 5$) is the real local variation of geopotentials at the main isobaric surface levels.

The calculated regression coefficients (i.e., the weighting factor of the empirically determined effect function) for the indicated equation are presented in both table and graph form. The author makes note of the agreement of the effect coefficients of vortex advection on the geopotential change at any level. Thus, for example, according to data for the first of the above-mentioned periods, vortex advection at the AT_{100} level exerted maximum influence on geopotential change. However, in absolute value the indicated coefficients of effect become larger as the level at which the geopotential is examined becomes higher. It is also pointed out that vortex advection at the AT_{300} level exerts little influence on geopotential variation at any level. In characterizing the effect of temperature advection at various levels on the change of geopotential, the author indicates that the sign of the effect coefficients changes with altitude in changes with altitude in conformance with theory. The author also sets up analogous equations of regression for the variation of temperature fields in free atmosphere.

In addition, the principles of temperature variation in the atmosphere were investigated on the basis of the heat influx equation, i.e., it was considered that local change of temperature depends on temperature advection, vertical movements, stratification, and nonadiabatic influx of heat. At the same time the author attempts to appraise the role of these individual factors.

The bibliograph contains five entries.

36. Study on Deep Seismic Soundings of the Earth's Crust

"The Correlation of Seismic Waves in Deep Seismic Sounding of the Earth's Crust," by P. S. Veytsman, Institute of the Physics of the Earth, Academy of Sciences USSR, Izvestiya Akademii Nauk, Seriya Geofizicheskaya, No 12, Dec 57, pp 1438-1452

The problem of the correlation detection of seismic waves and groups of waves which are registered in deep seismic sounding of the Earth's crust are considered. Groups of waves connected with the principal seismic boundaries in the earth's crust are distinguished on seismograms. The waves of different groups differ in a number of stable kinematic and dynamic characteristics. On the basis of an analysis of these features,

criteria for the separation and identification of groups of waves registered in separate profiles are formulated. The principles of group correlation permit carrying out the joint interpretation of the seismic registrations, obtained in a system of profiles located within the limits of 100 kilometers from the point of the explosion and at a distance of 10 kilometers between profiles.

The experimental work on deep seismic sounding showed that the basis of the methods of interpretation, developed mainly for conditions in the Tien Shan, are also applicable in other regions having a different structure.

A bibliography of 29 Soviet and non-Soviet sources is given. Fifteen of these are by G. A. Gamburtsev.

37. History of Organization of Magnetic Observatories in USSR

"Organization of the Network of Magnetic Observatories in the USSR for the Past 40 Years," by Yu. D. Kalinin, Scientific Research Institute of Terrestrial Magnetism, Ionosphere, and Radiowave Propagation, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 12, Dec 57, pp 1469-1477

The article presents a history of the organization of the network magnetic observatories in the USSR up to 1957 and the principal results of their work. The article is divided into six parts: (1) Magnetic Observatories in Russia Before the Revolution; (2) Network of Magnetic Observatories, 1917-1930; (3) Network of Magnetic Observatories, 1931-1940; (4) Network of Magnetic Observatories, 1941-1957; (5) Principal Works Accomplished in the Magnetic Observatories; and (6) Magnetic Variation Stations (Temporary and Expeditionary).

38. Soviets Introduce New Methods in Seismology

"Certain New Methods of Seismic Investigations," by G. A. Gamburtsev, with a supplement by Yu. V. Riznichenko, Izvestiya Akademii Nauk, Seriya Geofizicheskaya, No 12, Dec 57, pp 1431-1437

The article is in the form of a report on certain new methods of seismological investigations used under the direction and leadership of Gamburtsev by a number of Soviet seismologists of the Geophysics Institute of the Academy of Sciences USSR in collaboration with the academies of sciences of some of the union-republics (Georgian, Azerbaydzhan, Turkmen, and others).

The first of these is the idea of an azimuthal phase correlation of seismic waves based on the use of azimuthal seismic stations, which consist of a group of differently oriented seismographs having a single point of location. A variation of the azimuthal station was the use of an "inclined" seismograph, by means of which the component of soil movements along certain inclined axes are registered. The azimuthal method easily enables the visual separation of longitudinal, transverse, and surface waves on a background of irregular wave-disturbances, and also enables one to distinguish simple waves from waves distorted by interference. This is based on the stability of the polarization of the oscillations with time. In addition, this method requires only one point of observation in contrast to usual methods of seismic prospecting which may require two or more points of observation due to profile.

The second was the method developed for a more complete study of seismic phenomena. This was the widening of the frequency range in the registration of earthquakes. In this connection a new instrument was developed called the seismoinclinometer, with which low-frequency oscillations were recorded. This instrument differs from inclinometers in that it measures the speed of changes in the inclines rather than the inclines themselves.

The third development by Gamburtsev resulted in a method of deep seismic sounding of the earth's crust, the basis of which are the correlation principles of registering artificially created seismic waves. Results of this work led to much information on the characteristics of the geological structure in depth of certain mountain and foothill regions. The results indicated the possibility of significantly increasing the details of studying deep layers of the Earth's crust.

In his supplement to the article, Riznichenko reviews Gamburtsev's work and its continuation at present. In this connection he mentions the connection established between the structure of the Earth's crust and the character of the gravimetric field in the region of northern Pamir. Experimental work in the central part of the Caspian Sea for the purpose of developing methods of deep seismic sounding in the sea was done in 1956 by the Institute of Physics of the Earth, Academy of Sciences USSR, in collaboration with other organizations. At present expeditionary work is being done in the study of the Earth's crust in the transition zone between the Asiatic continent and the Pacific Ocean in the region of the Okhotsk Sea and the Western part of the Pacific Ocean.

All the investigations of earthquakes and the structure of the earth's crust were made and are being made by seismic methods with the use of other geophysical methods (gravimetry, magnetometry, etc.) and accompanied by geological investigations.

The author says that the methods of deep seismic sounding of the Earth's crust on land and the methods of studying weak local earthquakes developed in the USSR are more accurate and detailed than methods of this type being applied outside the USSR. However, he admits that in a number of important problems, the level of seismic investigations in the USSR is below that of certain foreign countries, for example, Japan, in the development of methods of observing earthquakes in the field of low-frequency oscillations, and the US and England in methods of studying the structure of the Earth's crust in the seas and oceans.

39. Thermal Circulation of Liquids Studied by Method of Photopolarization

"Photopolarization Method of Observing the Thermal Circulation of Liquids," by A. A. Dmitriyev, Tr. Mor. gidrofiz. in-ta AN SSSR, No 3, 1953, pp 30-34 (from Referativnyy Zhurnal -- Fizika, Geofizika, No 3, Mar 57, Abstract No 2340 by P. S. Lineykin)

The experimental work of the author on the observation of weak thermal currents and vertical waves in liquids is described. The large role of boundary effect, which causes turbulence of the liquid under the crest in the case of rapid wave motions, is established. In slow thermal circulations, the effect of secondary partitions is revealed by the appearance alongside them of descending movements.

Photographs of the motions of liquids in different models are presented. The possibility of successfully applying this method of photopolarization for studying the motion of liquids in plane-parallel models is shown.

40. Spectral Indices of Light Scattering in Water Drops

"Spectral Indices of Large Drops of Water and the Spectral Polarization of Rainbows," by K. S. Shifrin and Yu. I. Rubinovich, Main Geophysical Observatory imen' A. I. Voyeykov, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 12, Dec 57, pp 1491-1506

Using formulas of geometric optics, the article presents a calculation of the spectral indices of the scattering of light in large drops of water in that range of the spectrum where the absorption by the water can be disregarded (near the ultraviolet, the visible, and near the infrared). Also calculated is the polarization of the colored arch of the rainbow.

41. Opening of Yugoslav Geomagnetic Observatory

"Today the Geomagnetic Observatory Near Belgrade Will Be Opened" (unsigned article), Zagreb, Borba, 29 Nov 57, P 17

On 29 November 1957, the first Yugoslav Geomagnetic Observatory will be opened near Belgrade. It was built by the Federal Geodetic Administration is located in Brestovik near Grocka. It is equipped with all the equipment and apparatus necessary for geomagnetic measurements.

42. Hungarian Geophysics Institute Makes Radioactivity Counters

"New Hungarian Instruments" (unsigned article), Budapest, Nepakarat, 28 Sep 57, p 1

The workshop of the Lorand Eotvos Institute of Geophysics, Budapest, has produced a variety of instruments for measuring radiation. Some of these instruments are portable and battery-operated. They can be used to profile shallow drillings.

The institute has also built a profiling device for deep holes. It consists of a 2-meter-long probe equipped with four Geiger-Muller counters and is capable of giving readings to a depth of 2,000 meters.

43. Study on Temperature Variations in Surface Layer of the Sea

"Temperature Oscillations in the Surface Layer of the Sea Caused by Disturbance," by .G. .Ye. Kononkova and. N. V. Kontoboytseva, Moscow State University imeni M. V. Lomonosov, Izvestiya Akademii Nauk SSSR, Seriya Geofizicheskaya, No 12, Dec 57, pp 1478-1483

The results of the simultaneous registration of temperature and pressure variations in one point in the surface layer of the sea are presented. The presence of temperature variations with periods coinciding with the periods of the waves and with phases either coinciding with the phases of the waves or being displaced relative to them by 180 degrees are established. It is shown that these temperature variations are caused by the arrival of disturbances of water layers with different levels at the point of observation.

Geology

44. New Titanium-Zirconium Ore Deposits Surveyed in USSR

"Throughout the Country" (unsigned article), Moscow, Izvestiya,
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"In the basin of one of the tributaries of the Dnepr River -- the Samotkan' River -- a survey of a large deposit of titanium-zirconium ore has been completed. According to the extent of its reserves, the new deposit surpasses all the known deposits of titanium in our country."

V. ELECTRONICS

Communications

45. New Method of Phase Telegraph

"New Methods of Phase Telegraphy," by N. T. Petrovich, Moscow, Radiotekhnika, No 10, Oct 57, pp 47-54

The article discusses new possibilities of phase telegraphy reception utilizing the principle of relative comparison of signals on the basis of various intervals of time.

The author proves that the utilization of this principle will improve freedom from interference, as well as the transmission capacity of the telegraph radio lines. The transmission of telegraph messages is accomplished by utilization of two carrier frequencies, which periodically replace one another. Such a regular alternation of the frequencies permits determining the time limits of the transmitted signal, thus assisting in improving freedom from interference. This method also permits a simultaneous transmission of two messages without widening the frequency band of the channel.

46. New Soviet Radio Receiver "Festival"

"Festival'," Moscow, Novyye Tovary, No 7, 1957, p 5

The Riga Radio Plant imeni A. S. Popov designed a new high-class radio receiver "Festival'." The electric and acoustic parameters are considerably higher than those of similar foreign models.

The radio receiver has 12 miniature tubes and is designed for reception on long, medium, and short waves, also on UHF-FM. The output power of the receiver is 4 va with less than 3% of nonlinear distortion. The four loudspeakers develop a sound pressure of 20 bars. The set is provided with a remote control (up to 6 m). Its over-all dimensions are 660 x 425 x 310 mm and it weighs 24.5 kg.

The Council of Experts of the All-Union Trade Office awarded a first-degree diploma for the design of this model.

47. New Soviet Radio Receiver

"New Apparatuses," by F. Tormazov, Moscow, Radio, No 12, Dec 57, pp 34-35

The radio-phonograph "Volga" is a seven-tube, second-class super-heterodyne radio receiver intended for reception of long waves (722-2,000 m), medium waves (187-577 m), short waves (36.6-75.9 m and 24.8-35.3 m), and VHF-FM (4.11-4.65 m). Sensitivity of the receiver is 200 microvolts/m for AM reception and 20 microvolts/m for FM reception. The over-all dimension of the set is 580 X 415 x 360 mm and it has two 2GD-3 and two 1GD-9 loudspeakers. The power consumption is about 55 w. The price of the set is 1,400 rubles.

The production of radio-phonograph "Vesna" was begun at the "Ukrmuz-radioprom" Plant. The set is very similar to radio "Volga" and is priced at 1,400 rubles. The over-all dimensions are 600 x 425 x 375 mm.

The radio receiver "Voronezh-58" is a four-tube, fourth-class super-heterodyne receiver and is designed to receive programs on two bands of 723 to 2,000 m and 187.5 and 577 m. The sensitivity of the set is 400 microvolts/m and selectivity is 16 db. Tubes 6ILP, 6P14P, DG-Ts6 and 6Ts4P are used. Power consumption is about 30 w and output is 0.5 w. The over-all dimensions of the set are 270 x 210 x 160 mm; it weighs 4.2 kg and is priced at 240 rubles.

48. New Television Receiver "Zarya"

"Television Receiver 'Zarya,'" by F. Tormazov, Moscow, Novyye Tovary, No 7, 1957, p 16

The first lot of the Leningrad TV receiver "Zarya" will be available at the beginning of 1958. This set will be equipped with rectangular (21 x 28 cm) 25LK2B picture tube, 12 miniature tubes and semiconductor diodes. The over-all dimension of the set is 35 x 29 x 37 cm and it weighs 15 kg. The set is designed for the reception of five TV channels (49.75 to 99.75 Mc). The set has one 0.5GD-10 loudspeaker, which develops a sound pressure of 2 bars and has an audio response from 200 to 5,000 cps. The set is designed for operation from 220 v ac power supply and consumes about 110 w. Its sensitivity is 400 microvolts and the horizontal resolution is from 350 to 400.

49. TV Receiver "Belarus"

"TV Receiver 'Belarus'-3," Moscow, Novyye Tovary, No 7, 1957,
p 9

This table model TV-radio-phonograph combination with a rectangular 35 cm (diagonally) picture tube is designed for reception of AM radio broadcasts on frequencies of 150 to 415 kc, 520 to 1,600 kc, and 6 to 12.1 Mc and FM programs on 64.5 to 73 Mc. The TV circuit is designed for reception of programs on all five channels (49.75 to 99.75 Mc).

The TV circuit is assembled on a two-channel superheterodyne principle. The HF amplifier, mixer, and local oscillator are common to both video and audio circuits. The power supply can be drawn from 110, 127, or 220 v ac source and the power consumption is about 200 w. Horizontal definition of the picture is 450 lines and the vertical is 500 lines.

The "Belarus'-3" is built with standardized parts and components and with miniature tubes and semiconductor elements. The over-all dimensions of the set are 480 x 500 x 580 mm; it weighs 38.5 kg and is priced at 2,300 rubles.

50. Plans For Radio-Relay Line Development in USSR

"To Speed Up the Tempo of Radio Relay Development," Moscow,
Vestnik Svyazi, No 9, Sep 57, pp 1-2

The article discusses the plans for future development of radio relay equipment and lines in the USSR.

"For the purpose of exchange of TV programs with foreign nations it is planned to bring high-quality TV channels to the national boundaries of the USSR.

"At present 2,500 km of radio-relay lines are in operation which utilize 12- and 24-channel telephone communication equipment. In addition, Ryazan' and Stalinogorsk will receive Moscow TV programs. Before the end of this year [1957] the construction of TV transmission lines from Moscow to Yaroslavl', Ivanovo, Kostroma, Malyy Yaroslavets, and Kaluga will be completed.

"During the current year [1957] the construction of a series of radio-relay lines was begun, one of which will connect Leningrad with the capitals of the Near Baltic republics and the Belorussian SSR. The route of another line, beginning at Moscow, will pass to the south of the European part of the country; in the future it is planned to extend

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it to the Caucasus and to build branches to the Volga region and Ukraine. The construction is now carried on on the Moscow-Smolensk, Stalino-Voroshilovgrad, Ufa-Salavat, Chelyabinsk-Kustanay, and Riga-Kuldiga lines. The Tashkent, Frunze, Alma-Ata and Stalinabad trunk lines for telephone communications, and in the future for the exchange of TV programs, are now in the construction stage.

"Unfortunately, the industry is assimilating the production of standard equipment very slowly, thus seriously hampering the construction of the radio-relay lines on a wide scale.

"Only in 1957 the production of one of the standard high-frequency radio-relay apparatus P-60/120 was begun, which is intended for the transmission of TV programs to a distance of 1,000 km or transmission of 60-120 telephone channels by one high-frequency trunk line.

"During the current year [1957] production of a more powerful radio-relay apparatus P-240 ("Vesna"), which will permit the transmission of high-quality TV programs to a distance of 5,000 km and greater or the establishment of 240-600 telephone channels in a single high-frequency trunk line, will begin."

51. New Radio Relay Equipment

"Radio Relay Equipment P-60/120," by S. V. Borodich, Moscow, Vestnik Svyazi, No 9, Sept 57, pp 3-7

New radio relay equipment P-60/120 was designed by the personnel of the Scientific Research Institute and of an experimental plant of the Ministry of Communications USSR under the supervision of I. V. Kazistov, V. P. Minashin, A. V. Sokolov, M. V. Brodskiy, V. D. Kuznetsov, V. M. Shifrina, and Ya. M. Madorskiy.

The P-60/120 equipment is intended primarily for transmission of one simplex TV channel and two duplex telephone trunks. The latter can be multiplexed to 120 telephone channels with the aid of two K-60 apparatuses. The frequency band for the telephone trunks is from 12 to 552 kc. The TV audio channel is spaced in the frequency range from 275 to 290 kc of the telephone trunk.

The characteristic feature of the device is the utilization of the master oscillator of the transmitter as a local oscillator of the receiver. The basic parameters of the receiving-transmitting equipment are as follows: frequency range from 1,600 to 2,000 Mc (10 fixed frequencies for two telephone and one TV trunk are spaced here), output 3 w, noise factor 30, band width 20 Mc, frequency deviation in telephone circuit 100-200 kc per channel, for TV signal 14 Mc.

The test of the experimental model of the P-60/120 equipment was made successfully and proven it to be high-quality radio relay equipment. At one of the plants preparatory work for the series manufacture of the P-60/120 equipment is in progress.

Components

52. East German Miniature Capacitors

"The Duroplast Capacitor," by R. Bretschneider, Berlin, Nachrichtentechnik, No 10, Oct 57, pp 460-465

The article discusses and illustrates the miniature duroplast capacitors developed at the development station of the Gera Capacitor Plant (VEB Kondensatorenwerk Gera) and now being manufactured by the Goerlitz Capacitor Plant. Graphical information deals with the electrical properties and tropicalization of these new capacitors, and the advantages over the older type paper capacitors.

53. Cylindrical Slot Antennas

"Long-Wave and Medium-Wave Cylindrical Slot Antennas," by G. Z. Ayzenberg, A. M. Model' and L. P. Pozdnyakov, Moscow, Radiotekhnika, No 10, Oct 57, pp 5-16

The article describes low-support cylindrical slot antennas suitable for the transmission of long and medium waves (200-600 m). A 55 m diameter cylindrical slot antenna with 115 m diameter horizontal portion, suspended at about 20 m above the ground, will serve satisfactorily for transmission on a wave band from 200 to 600 m. The radiation power of such a cylindrical antenna is greater than that of a conventional antenna 200 m high. If 1,000 kw is fed to such a cylindrical antenna operating on 550 m wave, the voltage set up in the antenna would be about 100 kv. Such a voltage can be readily handled by regular suspension rod insulators.

The directivity pattern in the vertical plane, the radiation impedance, and the efficiency of such an antenna were calculated theoretically. Such calculations were checked with a small experimental cylindrical antenna built by one of the Ministry of Communications agencies. The radius of the cylindrical portion of this antenna was 24 m, and of the horizontal portion, 67.5 m; the length of the tuning stub was 30 m. The antenna consisted of a wire net suspended from one central and six peripheral 25 m wooden poles. The vertical portion of the cylinder consisted of 30 conductors. The distributing feeder line consisted of 26 wires supported by sixteen 3.5 m wooden posts. The grounding system consisted of 120 radially placed wires 150 m each and buried 25 cm underground.

The cylindrical antenna radiation efficiency may be as high as 90%.

Computers and Automation

54. Circuit Analysis of Digital Computers

"Block-Circuit Analysis of Series Electronic Digital Computers,"
by G. A. Mikhaylov, Moscow, Avtomatika i Telemekhanika, No 12,
Dec 57, pp 1109-1119

The article discusses the relationship between the structural features of the computer and the type of problem it has to handle. The working process of a series computer with a memory component in the delay line is characterized by the time utilization factor, which is generally of an order of 35%.

The mechanical efficiency of a series computer is characterized by the utilization factor of the structural components of the computer. By referring to this factor it is possible to judge the advantages of a specific block-circuit and the feasibility of changes in it to improve its performance.

Materials

55. Procedures for the Purification of Ge⁷¹

"Isolation of Radiochemically Pure Germanium Preparations," by
A. N. Baraboshkin, Ural Polytechnic Institute imeni S. M. Kirov,
Zhurnal Neorganicheskoy Khimii, Vol 2, No 11, Nov 57, pp 2680-
2681

The experiments described indicated that both participation as germanium disulfide and distillation in the form of germanium tetrachloride from a hydrochloric acid solution are effective methods for the purification of the radioactive isotope Ge⁷¹.

[SIR Note: Availability of a radioactive germanium isotope of a high degree of purity for use as a tracer is of importance in connection with the development of processes and control procedures to be applied in the production of germanium suitable for use as a semiconductor.]

56. The Structure of Seignettoelectrics of the Perovskite Type

"Structural Constants of the Internal Field in Seignettoelectrics With a Structure of the Perovskite Type," by G. S. Zhdanov, S. P. Solov'yev, and Yu. N. Venevtsev, Physicochemical Institute imeni L. Ya. Karpov, Kristallografiya, Vol 2, No 5, Oct-Nov 57, pp 639-645

Data published in the literature on the values of structural constants of internal fields in crystals with a structure of the perovskite type are reviewed critically. A correlation is established between structural constants in the cases when the dipoles are oriented along the [001], [011], and [111] directions in the cubical cell of the perovskite type. The structural constants have been calculated for the tetragonal cell of lead titanate at room temperature under consideration of the displacement of ions.

57. Study of NaBr-CuBr Phosphors

"Narrow Luminescence Bands of the NaBr-CuBr Phosphors," by N. I. Ivanova and P. Shvist, Scientific Research Physics Institute of Leningrad State University, Leningrad Optika i Spektroskopiya, Vol. 3, No 4, Oct 57, pp 399-400

NaBr-CuBr phosphors were prepared by heating the base mixtures and the activator. The luminescence of such phosphors, besides known bands of a monocrystal, exhibits an intensive narrow violet band with a maximum at 421 mμ. The luminescence centers emitting narrow bands of NaBr-CuBr or of CuBr probably do not belong to the lattice structure of NaBr-CuBr or CuBr crystals. Such facts as the close location of NaBr-CuBr and CuBr bands, the weak effect of the copper salt anion on the luminescence spectrum, and the low temperature of heating necessary for the appearance of NaBr-CuBr luminescence rather prove that the luminescence centers are located on the crystal surface of NaBr or the pure copper salt and that they interfere little with the crystal.

58. Study of Boron Phosphors

"Influence of Decay on Phosphorescence Spectra of Boric Acid Luminophores," M. D. Khalupovskiy, Laboratory of Luminescence, Odessa State Pedagogical Institute, Leningrad, Optika i Spektroskopiya, Vol. 3, No 4, Oct 57, pp 385-387

Experimental tests of phosphorescence spectra were made with an accuracy up to 1% on equipment consisting of a single disk phosphoroscope, glass monochromator MS-Sh, and a photoelectron multiplier FEU-17. Results showed that the spectrum shape of boric acid-salicylic acid and boric acid-fluorescein phosphor remains unchanged during the decay of phosphorescence. The decay law is strictly exponential in the wave range of 395-494 mμ and is characterized by the same decay constant. Starting with 494 mμ, a slight deviation from exponential law is noted.

VI. ENGINEERING

59. Shell Design of a Caisson-Type Swept Wing

"Design of Shells of a Caisson-Type Swept Wing on the Basis of the Theory of V. Z. Vlasov," by I. F. Obratsov, Tr. Mosk. aviats. in-ta, 1956, No 59, 47 pp, ill (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9319, by L. I. Balabukh)

This work presents a systematic description of an alternate method of V. Z. Vlasov which is suitable for stress analysis of swept wings.

A detailed calculation is presented for swept wings with rigid end seals taking into account wing center panel performance.

The results of the calculations are illustrated by graphs. Results are given for the bending of swept wing cells. The author's approximation formulas are used for numerical calculations of stresses in these cells.

The results of these calculations are in complete agreement with experimental data.

60. Turbine Disk Cooling

"Investigation of the Cooling of Turbine Disks by Blowing Air Through Mount Clearances of Fir Tree Blade Roots," by I. T. Shvets, E. P. Dyban, N. M. Kondak, Sb. tr. In-ta teploenerg. AN USSR, 1956, No 13, pp 20-30 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9103, by L. I. Kiselev)

An examination is made of the thermal condition of a bladed turbine disk while cooling air is being blown through clearances in the fir tree locks.

An approximate determination of the temperature field is made as a result of the solution of an equation for heat conductivity and by the use of known relationships for coefficients of heat exchange in elements of the working wheel.

Expressions are given for the temperature of the rim at the root section and the consumption of air during radial cooling of the disc. A comparison of both cooling methods shows that the one using cooling air through lock clearances is more efficient.

The abstracter refers to a similar comparison made in Izv. AN SSSR. Otd. tekhn. n., 1956, No 6, pp 77-88.

61. Graphical Calculation of Thick-Walled Vessel Strength

"Graphical Method of Calculation of the Strength of Certain Thick-Walled Vessels," by T. V. Ivanova, V. M. Kladnitskiy, Tr. Dal'nevost. politekhn. in-ta, 1955, No 44, pp 21-31 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9291, by V. K. Prokopov)

This work presents a graphical method of calculation of the strength of thick-walled vessels in which substitution of the variable designated by R. Grammel' (cf. Bitseno, K. B., Grammel' R., Tekhnicheskaya Dinamika, Gostekhizdat, 1952, Vol 2, p 23) is used. On the basis of the calculation, approximation formulas obtained by the authors in the preceding work (Tr. Dal'nevost. politekhn. in-ta, 1949, No 37) are used.

62. Planar Multi-Linked Hinged Mechanisms

"The Problem of the Investigation of a Certain Class of Simplest Planar Mechanisms," by A. A. Dmitrevskiy, Tr. Leningr. voen.-mekhan. in-ta, 1955, No 3, pp 63-68 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 8671, by V. A. Zinov'yev)

It is shown that a planar five-linked hinged mechanism is a general form of the class of planar four-linked systems. The calculating formulas necessary for kinematic analysis and introduced for the five-linked mechanism prove to be suitable for kinematic analysis of mechanisms derived from it. Proof is given of the feasibility of utilization of these formulas in kinematic design of multilinked planar mechanisms.

63. Warsaw Polytechnic Professor in Hungary on Study Tour

"Czechoslovak, Polish, Rumanian Scientists and Ministerial Leaders Arrived in Hungary" (unsigned article), Budapest, Nepszabadsag, 12 Nov 57, p 5

Tadeusz Kotter, a professor in the Electric Machine and Transformer Department at the Warsaw Polytechnic, arrived in Hungary for a 2-week study tour.

64. Czechoslovak Specialists on Study Tour in Hungary

"Czechoslovak, Polish, Rumanian Scientists and Ministerial Leaders Arrived in Hungary" (unsigned article), Budapest, Nepszabadsog, 12 Nov 57, p 5

Jiro Simanek, engineer and lecturer in the Department of Coke and Gas Production at the Czech Advanced Technical School in Prague; Jiri Klima, lecturer in the Department of energetics at the Technical School; and Ludvik Vegh, engineer and lecturer in the Reinforced Concrete Department at the Czech Advanced Technical School, came to Hungary for a 2-week study tour.

VII. MATHEMATICS

65. Interpolation Polynomials

"Interpolation Polynomials For Functions of Several Variables," by A. P. Filin, Leningrad, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep-Oct 57, pp 678-688

Two forms of expressing interpolation polynomials for functions of several variables are suggested. The coefficients found are tabulated and facilitate permanent computations. It is assumed that for each variable the interpolated section is divided into equal parts. To determine the above-mentioned coefficients, use is made of previously computed coefficients for the interpolation polynomial for a function of one variable.

66. System of Differential Equations With Discontinuous Right Members

"Stability in Linear Approximation of a Periodic Solution of a System of Differential Equations With Discontinuous Right Members," by M. A. Ayzerman and F. R. Gantmakher, Moscow, Physico-technical Institute, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep-Oct 57, pp 658-669

The stability of a periodic solution $z_1 = z_1^0(t)$, $z_1^0(t + \tau) = z_1^0(t)$, of a system of equations of the type $\frac{dz_1}{dt} = f_1(z_1, \dots, z_n, t)$ is analyzed in the case when the right members f_1 have discontinuities at some points of the integral curve $z_1 = z_1^0(t)$. It is demonstrated that if a zero solution of a linear approximation is asymptotically stable, then the periodic solution $z_1 = z_1(t)$ of the initial nonlinear system of equations is also asymptotically stable.

67. Yugoslav Symposium on the Theory of Differential Equations

"Symposium on the Theory of Differential Equations," by E. S., Belgrade, Borba, 14 Dec 57, p 5

The article said that the Association of the Societies of Mathematicians and Physicists of Yugoslavia would conduct a symposium on the theory of differential equations at the Faculty of Natural Sciences and Mathematics in Belgrade on 16-21 December 1957. Discussion was to emphasize some significant problems and results of the theory of differential equations, which are especially important for mathematics and its application in technology and the natural sciences. Reports were to be

presented by Academician N. Saltikov and university professors T. Pejovic, D. Markovic, B. Rasajski, K. Orlov, Dj. Karapandzic, and B. Jaksic. Mathematicians will also be present from Zagreb, Ljubljana, Sarajevo, Skoplje, and the larger educational centers.

Mathematicians from foreign countries who have been invited to participate include A. Denjoy, member of the French Academy of Sciences; I. G. Petrovskiy, rector of the University of Moscow and member of the Academy of Sciences USSR; F. Tricomi, director of the Institute for Mathematical Analysis of the University of Turin and member of the Italian Academy of Sciences; S. L. Sobolev, professor of the University of Moscow, director of the Mathematics Institute imeni V. A. Steklov and member of the Academy of Sciences USSR; J. Leray, professor of the College de France and member of the French Academy of Sciences; and L. Kolatz professor of the University of Hamburg and director of the Institute of Applied Mathematics.

This is the fifth such symposium conducted in Europe since the World War II. The scientific papers presented at the symposium will be published in a special publication by the Association of Mathematicians and Physicists of Yugoslavia.

68. Yugoslav Academician Dies

"Dr Petar Jovanovic, Professor of the Faculty of Natural Sciences and Mathematics, Has Died" (unsigned article), Zagreb, Borba, 16 Nov 57, p 4

Dr Petar A. Jovanovic, professor on the Faculty of Natural Sciences and Mathematics in Belgrade and secretary of the Serbian Academy of Sciences in Belgrade, died on 15 November 1957 in Belgrade. He was one of the students of Dr Jovan Cvijic, whose work he continued. He wrote many scientific works, which included works on the topography of the Belgrade area, on the Karst, and the morphology and hydrography of the Skoplje area. His main work was the work entitled Uzdusni rijecni profili (Longitudinal River Profiles), which was also published in French.

VIII. MEDICINE

Bacteriology

69. Para-Agglutinable Properties Developed Experimentally in B. coli

"The Experimental Production of Para-Agglutinable Properties in Strains of B. coli in vitro," by K. A. Maksimovich, Sbornik Nauchnykh Rabot L'vovskogo Nauchno-Issledovatel'skogo Instituta Epidemiologii, Mikrobiologii, i Gigieny (Collection of Scientific Works of the L'vov Scientific Research Institute of Epidemiology, Microbiology, and Hygiene), L'vov University, 1956, pp 41-45 (from Referativnyi Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 73079, by M. Ya. Boyarskaya)

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"Experiments on producing para-strains of B. coli by changing the pH of the medium on which it had been inoculated according to Lutz's method were performed. Two hundred and twelve typical strains of B. coli which are not agglutinated by nine agglutinating sera (Flexner, Sonne, typhoid, paratyphoid A, paratyphoid B, etc.) were selected. The strains were adapted to alkaline bouillon (pH 7.4-8.4) by six serial passages. As a result of passage the strains acquired the capacity for para-agglutination with increasing titer. The capacity appeared at the maximum after culturing the strains on a very alkaline bouillon. Seeding on an acid medium suppressed para-agglutinable properties. The formation of para-agglutinable properties in strains of B. coli occurs as a result of the modifiability of these bacteria due to the effect of changes in the conditions of their existence. Therefore, the author considers that para-agglutinating strains have no diagnostic significance."

70. Sensitivity of Pasteurella to Sunlight

"Resistance of Bacteria of the Pasteurella Group," by G. G. Martirosyan, Trudy Armyanskogo Nauchno-Issledovatel'skogo Veterinarnogo Instituta (Works of the Armenian Scientific Research Veterinary Institute), No 8, 1955, pp 59-63 (from Referativnyi Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 73135, by Yu. F. Bychkov)

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"Five strains of Pasteurella -- the pathogens of pasteurellosis of animals -- were cultured in test tubes with meat peptone agar and meat peptone broth for 24 hours at 37° C. Fifty percent of the test tubes, some sealed with paraffin and others not, were kept in a refrigerator at 3-8°, and the other 50% at room temperature (15-20°) under the effect of direct sun's rays for 2-3 hours a day. Every 10 days during the 2 months

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of the experiment, material from the test tubes was seeded on Meat peptone agar and meat peptone broth, and mice were infected with a culture of each strain once every 20 days. The cultures kept in the refrigerator died after 20-30 days, and those kept at room temperature remained viable no less than 2 months. In the author's opinion, Pasteurella is less sensitive to the action of sunlight than has been heretofore considered."

[For additional information on bacteriology, See Item No 3.]

Virology

71. Tick-Borne Encephalitis in Tomsk

"Virological Investigation of Tick-Borne Encephalitis in the Tomsk Focus," by M. K. Tyushnyakova, Trudy Tomskogo Nauchno-Issledovatel'skogo Instituta Vaktsin i Syvorotok, (Works of the Tomsk Scientific Research Institute of Vaccines and Sera), No 7, 1956, pp 53-61 (From Referativnyi Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 72806, by G. D. Zasukhina)

"Eighty-three strains of tick-borne encephalitis virus were isolated during the 1948-1954 period. Of these, 44 strains were isolated from Ixodes persulcatus ticks by intracerebral infection of white mice. The incubation period in mice was 3-11 days. The percentage of virus-carrying in ticks fluctuated from 1.6 to 3.2%. Five virus strains were isolated from the brains of wild animals (Microtus, Sicistinae, and Shrews; 108 animals were observed). The incubation period lasted 6-14 days. Thirty-four strains were isolated from patients' blood and fluids (172 persons were examined). The incubation period was 4-18 days. The most virulent strains were isolated from ticks. The indexes of immunogenic and antigenic characteristics of four strains of virus isolated from ticks, wild mammals, and humans in the cross neutralization reaction with guinea pig hyperimmune serum were compared. All four strains were found to be antigenically identical, but strains isolated from ticks were most efficacious immunogenically. The antigenic structure of the strains isolated was compared by the neutralization reaction with the antigenic structure of tick-borne encephalitis strains from other oblasts of the USSR. All sera of strains isolated had high neutralizing activity."

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72. Omsk Hemorrhagic Fever Carried by Dermacentor marginatus Ticks

"Spontaneous Carrying of the Omsk Hemorrhagic Fever Virus by Dermacentor marginatus Ticks," by A. V. Gagarina, Trudy Tomskogo Nauchno-Issledovatel'skogo Vaktzin i Syvorotok (Works of the Scientific Research Institute of Vaccines and Sera), No 7, 1956, pp 289-296 (from Referativniy Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 72837, by G. D. Zasukhina)

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"Sixteen hundred and sixty-two specimens of D. marginatus and 1,016 of D. pictus -- specific vectors of the disease -- were investigated. The virus was isolated on white mice. A great number of strains were isolated from D. pictus in foci of northern forest-steppe territory, and from D. marginatus, in southern forest-steppe territory and in the steppe zone. Strains isolated from D. marginatus were identified in cross neutralization experiments with hyperimmune serum with respect to strains isolated from D. pictus (from northern and southern foci), from the blood of persons in the southern foci, from D. marginatus in the same foci, and with respect to laboratory strains and convalescent sera. All hyperimmune sera and convalescent sera appeared to be serologically related to the strains studied (high neutralization indexes). D. marginatus, which predominates in the southern forest-steppe territory, is the primary vector of the disease in this area."

73. Chinese Study Russian Spring-Summer Encephalitis Virus

"The Isolation and Determination of Spring-Summer Encephalitis Virus and Preliminary Investigation of Its Biological Characteristics," by Wang I-min (王逸民), Department of Virology, Chinese Academy of Medical Sciences, Chung-hua I-hsueh Tsachih (National Medical Journal of China), Vol 43, No 11, 1957, pp 862-865

This article presents the details of experiments which led to the isolation and subsequent study of five strains of Russian spring-summer encephalitis virus. The virus was recovered from the brain matter of patients who died of neurotropic diseases in "a certain forest district" in China in June and July 1952. The specimens had been forwarded to the Chinese Academy of Medical Sciences (Peiping), where this study was made.

Cross neutralization and active immunization tests positively identified the strains as Russian spring-summer encephalitis virus. Killed virus vaccine, containing 0.3 percent formalin and prepared by the author and his colleagues, was used in the cross immunization tests.

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The following conclusions were obtained in a study of the biological characteristics of the virus:

"The white mouse, shrew, and chick embryo are most sensitive to the virus, while the house rat, pigeon, and hatched chick are not."

"Maintained for generations in the fertilized egg, the virus was found in highest concentration in the tissues of the developing chick embryo and also in considerable amounts in the chorio-allantois, the vitelline membrane, and the allantoic fluid. Moreover, there was no appreciable difference between the titers in 8-day-old and 9-day-old embryos."

"Contrary to the report of A. A. Smorodintsev, the virus titer in the developing chick embryo was no lower than that reached in inoculated mouse brain. This indicates that the fertilized egg may be used to greater advantage than the smaller mouse brain in spring-summer encephalitis vaccine production."

"Three-week-old white mice are as sensitive to spring-summer encephalitis virus when it is introduced intracerebrally as when it is introduced intra-abdominally."

"A 0.3 percent concentration of formalin will kill the virus in 5 days, but a 0.1-0.2 percent concentration cannot kill it in 2 weeks."

Epidemiology

74. Equine Encephalomyelitis in the Ukrainian SSR

"Study of Foci of Infectious Equine Encephalomyelitis in the Ukrainian SSR," by M. V. Revo, V. I. Kotov, and V. P. Obratsov, Nauchnyye Trudy Ukrainskogo Instituta Eksperimental'noy Veterinarii (Scientific Works of the Ukrainian Institute of Experimental Veterinary Medicine), No 23, 1956, pp 13-21 (from Referativniy Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 72822, by N. V. Kozlyakov)

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"The first cases of the disease were usually observed in May; the maximum incidence, which was noted in September-October, frequently assumed an enzootic character. Only work horses became ill. The enzootics lasted for 50-183 days on the whole; the disease was observed with definite periodicity. In the authors' opinion, animal virus-carriers and blood-sucking insects, especially *Stomoxys calcitrans*, play a large part in spreading infectious encephalomyelitis among horses. The authors hypothetically admit the possibility of immunizing susceptible animals from immune horses (horses

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which have recovered from or been in contact with the disease) through the bites of virus-bearing insects and consider that evidently the periodicity of outbreaks of infectious encephalomyelitis among horses can depend to a definite extent on the number of immune animals in areas threatened with the disease."

Hematology

75. Morphology and Clinical Management of Hypoplastic Blood Conditions Reviewed

"Pressing Problems of the Morphology and Clinical Management of Hypoplastic Hemopoietic Conditions," by Prof I. A. Kassirskiy, Corresponding Member, Academy of Medical Sciences USSR, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 5, Sep/Oct 57, pp 11-24

"On the basis of personal experience and data from literature, the author points out the difficulty of diagnosing hypoplastic states, especially in atypical cases, and in stages where the sternal puncture reveals a pronounced cellular reaction.

"The importance of evaluation of total and partial myelograms and the estimation of curves of erythroblast and neutrophil maturation is emphasized. In hypoplastic states the picture of "pure red cell" and "pure white cell" bone marrow might be present; in dynamics they gradually transit into hypo- and aplastic bone marrow pictures. Various forms of hypoplastic states are differentiated in accordance with the etiology and dynamics of the disease. The possibility of development of acute leukemia against a background of hypoplastic state, as well as the presence of hypoplastic forms of acute leukemia, is indicated.

"In the treatment of hypoplastic states significance is denoted to corticosteroid hormones. Best results were obtained with meticorten."

-- English abstract

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76. Histochemical Studies Consisting of Fat, Glycogen, and Nucleic Acid Content of Blood Elements Discussed

"Histochemical Studies of the Elements of Hematopoiesis, (1). Fat, Glycogen, and Nucleic Acids Contained in the Blood Cells and in the Bone Marrows of Healthy People and of People Suffering Leukosis," by E. I. Terent'yeva, A. I. Zosimovskaya, and L. I. Kazanova, Central Order of Lenin Institute of Hematology and Blood Transfusion (director, Prof A. A. Bagdasarov, Active Member, Academy of Medical Sciences USSR), Ministry of Health USSR, Problemy Gematologii i Perelivaniya Krovi, Vol 2,

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"Studies on the content of fat, glycogen, and nucleic acids in the cells of blood and the bone marrow of healthy people and of patients afflicted with leukemia were made. Certain deviations in the content of the investigated substances were noted in patients with leukemia as compared with healthy persons. These changes may indicate lesions of normal fat, glycogenic, and nucleic metabolism in patients with leukemia. In most patients a relationship is noted between the content of fat, glycogen, and nucleic acids in the cells of the hematopoietic tissue and the gravity of the disease. As the condition of the patient grows worse, fat content increases, and glycogen and nucleic acids decrease in the blood cells. On the other hand, when the condition of the patient improves, the amount of fat in the cells decreases, while glycogen and nucleic acids increase." -- English abstract

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77. Analysis of Causes for Fluctuation in Reticulocyte Maturation Rates Studied

"Concerning the Maturation of Reticulocytes," by Yu. P. Popov, Chair of Hospital Therapy (head, Prof A. G. Teregulov, Honored Worker of Science) and the Chair of Propaedeutics of Internal Diseases (head, Prof A. I. Brening), Kazan Medical Institute, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 5, Sep/Oct 57. pp 32-36

On the incubation of blood at 37° C, maturation of reticulocytes from normal blood lasted 14-16 hours. Speediest reticulocyte maturation occurs at this temperature; decreasing the temperature delays reticulocyte maturation, and under sufficiently low temperatures maturation ceases.

Preliminary staining of the blood steps reticulocyte maturation during incubation. X-ray irradiation of rabbits by 3,500-4,200 r decreases the number of reticulocytes for 40-50 hours. Decrease of the number of reticulocytes occurs in the form of waves, which indicates that for a certain length of time, after the effects of radiation, reticulocytes still continue to enter the blood.

In the peripheral blood of healthy people, reticulocytes mature, on the average, in 12-14 hours after they leave the bone marrow. In hyperchromic anemias, they mature faster, and in hypochromic anemias, they mature slower.

78. Advances Achieved in the Development of Blood Substitutes in the Soviet Union During Recent 40 Years Reviewed

"The Development of the Problem of Blood Substitutes in the Soviet Union During the Past 40 Years," by P. S. Vasil'yev, Central Order of Lenin Institute of Hematology and Blood Transfusion (director, Prof. A. A. Bagdasarov, Active Member, Academy of Medical Sciences USSR), Ministry of Health USSR. Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 5, Sep/Oct 57, pp 36-42

The author reviews Soviet advances in the field of blood substitutes. Mention is made of using sodium chloride, sea water, antishock-narcotic fluid (TsIPK) of N. A. Fedorov, antishock fluid (TsOLIPK) of A. A. Bagdasarov salt in the form of ampules or pills, mixture in conjunction with 10% blood (according to I. R. Petrov), glucose solution containing 20% blood serum (according to N. A. Fedorov), etc. A method has been developed by the Central Institute for the preparation of therapeutic serum by filtration through a Zeytts sterilizing plastic filter.

At present, use of dry plasma, saturation of blood plasma and serum with vitamins, antibiotics, and narcotic preparations, and heterogenic and synthetic preparations as blood substitutes find extensive use. Experimental and clinical results of using therapeutic serum (LSB) of N. G. Belen'kiy, prepared from plasma of cattle, are compared with those from preparation BK-8. The latter proves superior, since it is less anaphylactic. Protein hydrolysate, especially from casein, preparation L-103, and preparations from serum, whole blood, and blood coagulum from animal blood are used extensively.

Synthetic blood substitutes of the dextran type prepared by microbiological synthesis and of the polyvinyl pyrrolidone polymers prepared by chemical synthesis have proved very effective.

Blood substitutes recently developed include a synthetic organic compound called carboxymethylcellulose developed by the Central Institute in conjunction with the Moscow Petroleum Company. Carboxymethylcellulose has also been developed by the Minsk Institute for Blood Transfusion. The Leningrad Institute for Blood Transfusion has developed a blood substitute made from starch.

Such accomplishments prove that the Soviet Union has developed a number of blood substitutes that can be recommended as effective therapeutic means for a number of pathological conditions, and prospects for greater advancements in this field are great.

79. Efficacy of Protein Hydrolysates in Parenteral Feeding Discussed

"Efficacy of Protein Hydrolysates in Parenteral Feeding," by Z. A. Chaplygina, Leningrad Order of Red Banner of Labor Scientific Research Institute for Blood Transfusion (director, Docent A. D. Belyakov; scientific adviser, Prof A. N. Filatov, Corresponding Member, Academy of Medical Sciences USSR), Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 5, Sep/Oct 57, pp 43-47

"The efficacy of various protein hydrolysates was studied in experiments on dogs. Hypodermic and intravenous injections produced identical effects. A more complete utilization of amino acids for the synthesis of proteins of the blood has been attained when hydrolysates were introduced with alcohol

and vitamin B₆." -- English abstract

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80. Two-Step Method for Preparing Alcohol-Glucose-Saccharose-Citrated Erythrocyte Mass Based on Duplex Ampules Connected in Closed System

"Two-Step Method for Preparing Alcohol-Glucose-Saccharose-Citrated Erythrocyte Suspension," by R. N. Akimova and R. A. Krivoruchko, L'vov Scientific Research Institute for Blood Transfusion (director, Docent D. G. Petrov), Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 5, Sep/Oct 57, pp 51-55

An erythrocyte preservative consisting of 10% alcohol plus glucose-saccharose-citrated solution (80 g saccharose, 6 g glucose, 3.5 g sodium citrate, and one g albucid of sodium, and distilled water up to 1,000 g) is described. The processed and sterilized solution was sealed in 100 - 125 ml ampules, and preserved at 4-6° also at room temperature (14-16°) for up to 55 days. This preservative is added to erythrocyte mass in the ratio of 1:1.

A table representing the time for the onset of latent and evident hemolysis in the alcohol-erythrocyte suspension indicates that the greater the age of the preservative solution before its mixing with erythrocyte mass, the sooner is the onset of hemolysis in the suspension.

The system consists of a lower (250 ml) ampule containing the erythrocyte mass connected in a closed system by two smaller ampules containing the preservative solution, all joined by a T-system of tubing.

81. Survival in the Recipient of Erythrocytes Prepared by Ion-Exchange Adsorbents

"Survival, in the Organism of the Recipient, of Erythrocytes of Blood Prepared With Ion-Exchange Adsorbents," by G. M. Abdulayev and L. I. Fedorova, Central Order of Lenin Institute of Hematology and Blood Transfusion (director, Prof A. A. Bagdasarov, Active Member, Academy of Medical Sciences USSR), Ministry of Health USSR, Problemy Gematologii i Perelivaniya Krovi, Vol 2, No 5, Sep/Oct 57

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"The vitality of erythrocytes in cationic blood was studied by assaying the survival of transfused erythrocytes in the recipients' body. The test was made by the method of selective agglutination with the use of anti-M and anti-N immune sera. The survival of erythrocytes transfused directly was tested for comparison. Investigations show that the erythrocytes of cationic blood are as vital as those in direct transfusion." -- English abstract

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82. Thrombotropine Is Bound to Alpha-Globulin Fraction, Tests Indicate

"The Protein Nature of Thrombotropine," by G. V. Andreyenko, Moscow State University imeni M. V. Lomonosov, Doklady Akademii Nauk SSSR, Vol 112, No 3, 21 Jan 57, pp 474-476

The author used electrophoresis for the separation of plasma proteins in a starch solution, followed by the analysis of the homogenous protein fraction of human and of rats' plasma.

Data indicate that the gamma-globulin fraction is completely devoid of thrombotropine activity, while fractions containing alpha-globulins always seem active. Therefore, the author concludes that thrombotropine is bound to the alpha-globulins.

83. Species Specificity of Prothrombokinase and Thrombokinase of Both Blood Platelets and of Brain of Man and Certain Animals

"Species Specificity of Prothrombokinase of Blood Platelets and of Thrombotropine," by T. M. Kalishevskaya, Moscow State University imeni M. V. Lomonosov, Doklady Akademii Nauk SSSR, Vol 112, No 3, 21 Jan 57, pp 477-480

Previous research has indicated that blood platelets and brain tissue are the sources of prothrombokinase, while plasma contains its activator, i.e., thrombotropine.

The present report is a study of species specificity of prothrombokinase of blood platelets and of brain tissue. Experiments were conducted on fresh oxalated plasma of man and of animals (rats, guinea pigs, rabbits, horses, and roosters). Blood platelets were isolated according to standard methods of centrifugation. Three tables indicate variation of time, in seconds, for the coagulation of oxalated plasma of man and of various species of other animals, using various combinations of thrombogenic components, in optimum Ca ion concentrations.

Results indicate the following:

1. The addition of prothrombokinase of blood platelets and of brain tissue significantly speeds the process of plasma coagulation.
2. Preliminary activation of prothrombokinase of blood platelets and of brain tissue by the addition of thrombotropine of the same species causes an even greater speeding of plasma coagulation.
3. Experimental results, furthermore, indicate certain differences in the properties of prothrombokinase of blood platelets and prothrombokinase of brain tissue in the same species.
4. Both the prothrombokinase of the brain tissue (to a greater degree) and the prothrombokinase of blood platelets (to a lesser degree) possess definite species specificity.
5. Thrombokinase of blood platelets and also thrombokinase of brain tissue are devoid of species specificity, and therefore it is effective in speeding the conversion of prothrombin into thrombin in the plasma of different species.

84. Dye From Datisca Cannabina Successfully Used for Simultaneous Counting of Erythrocytes and Blood Platelets on Smears in Luminescent Microscope

"New Luminescent Method of Simultaneous Recognition of Erythrocytes and Blood Platelets," by Yu. N. Zubzhitskiy, Chair of Microbiology, Leningrad Sanitary Hygiene Medical Institute, Vol 18, No 5, Sep/Oct 57, pp 402-404

The author describes a new method for staining blood smears with an aqueous solution of the alcoholic extract of Datisca cannabina (Datiska konoplevaya). The latter is a perennial plant that grows extensively in many southern regions of the Soviet Union. Long ago, both the roots and the leaves of this plant were used for dyeing wool and silk with bright orange-yellow color. Roots contain 10.5% and leaves contain 6% of the coloring substance (flavone: 3-, 5-, 7-, 2-tetraoxyflavone).

By using this fluorescent substance, one can simultaneously count both the erythrocytes and the platelets of blood smears against a darkened background in a luminescent microscope.

85. Hungarians Produce Gamma Globulin

"Gamma Globulin, the Drug Made From Blood," by E. Kindzierszky, Budapest, Nepszeru Technika, Dec 57, pp 380-381

The article discusses the preparation of gamma globulin in Hungary. The National Blood Transfusion Service and the Human Serum Producing and Research Institute both prepare gamma globulin, using the Cohn process. The drug is said to be 95-100 percent pure and equal in quality to any similar foreign preparation.

The article includes four photographs taken at the laboratory of the Blood Transfusion Service showing various steps in the preparation of gamma globulin.

[For additional information on hematology, See Item No 105.]

Nutrition

[See Item No 7.]

Parasitology

86. Chinese Writes On Toxoplasmosis

"Toxoplasmosis," by Yu En-shu (于 恩. 庶), Fukien Institute of Infectious Diseases, Chung-hua I-hsueh Tsa-chih (National Medical Journal of China), Vol 43, No 11, 1957, pp 903-904

This article gives a summary of toxoplasmosis -- the characteristics of the pathogen, routes of infection, symptoms, diagnosis, and treatment. The author says that his presentation was inspired by the paucity of reference data available to Chinese readers concerning the subject and that his information is based on personal experience as well as American, British, Soviet, and Japanese literature cited.

In the author's experience, the daily administration of 25 milligrams of sulfadiazine per kilogram body weight proved effective in treating white mice with toxoplasmosis. He cites reports on the efficacy of other drugs such as sulfone and Daraprim used in combination with sulfadiazine.

87. Chinese Observe Reactions to Different Degrees of Schistosoma Infestation

"The Pathologicophysiological Reactions of Rabbits Infested With Different Amounts of Schistosoma Cercariae," by Chang Tzu-ch'iang (張 志 強), Yao Min-i (姚 民 一), Lin Hui (林 慧), Sun Man-chi (孫 曼 奇), and Chou T'ing-ch'ung (周 廷 冲), Department of Pharmacology, Chinese Liberation Army Academy of Medical Sciences, Shanghai; Peiping, Sheng-li Hsueh-pao (Acta Physiologica Sinica), Vol 21, No 3, 1957, pp 275-282

In a study undertaken to determine the indications of the state of illness and effect of treatment in schistosomiasis, the pathologicophysiological reactions of four groups of rabbits experimentally infected with 100, 150, 600, and 1,000 schistosoma cercariae, respectively, were observed and compared with the normal state of a control group. The details of the experiments are reported in this paper, which is published with the following English abstract:

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"The erythrocyte sedimentation rate (E.S.R.) of the experimental rabbits began to increase in the fifth week after inoculation of cercariae, the increase being parallel to the severity of the cercariae infestation. It was most obvious in the experiments carried out at 10-20 degrees centigrade room temperature, but was less conspicuous when the temperature was higher. In the control group, the E.S.R. remained normal and was not influenced by the room temperature.

"The plasma fibrinogen-and gammaglobulin-content of the blood of experimental rabbits increased with the E.S.R.

"The body weight of experimental rabbits began to decrease in the eighth week after inoculation of cercariae, while that of rabbits in the control group steadily increased during the course of the experiment.

"The complemental activity began to increase in the fifth week after inoculation. The heavier the infestation, the lower was the complemental activity. This was probably due to the anticomplemental effect of gamma-globulin.

"The prothrombin time remained normal during the 11 weeks of the experiment.

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"The time of occurrence and severity of these pathologicophysiological reactions may be related to the egg-laying activity of the Schistosoma and particularly to the maturation of the eggs in the liver of the animals."

The authors say that the present paper is a sequel to another published in Chung-hua I-hsueh Tsa-chih (National Medical Journal of China), Vol 42, No 4, 1956, under the title "The Physiological Reactions of Rabbits Infested With Different Amounts of Schistosoma Cercariae," by Chang Tzu-ch'iang, Yao Min-i, and Lin Hui. The cercariae used in the earlier experiments were donated by the Northeast Branch (Nanking) of the Central Institute of Health (Chung-yang Wei-sheng Yen-chiu-yuan); that used in the recent experiments, by the Nanking Institute of Parasitic Diseases, Chinese Academy of Medical Sciences, Ministry of Health.

[SIR Note: The Central Institute of Health in 1957 was reorganized and renamed Chinese Academy of Medical Sciences, Ministry of Health. It seems reasonable to believe that the Nanking Institute of Parasitic Diseases mentioned above may be the former Northeast Branch of the Central Institute of Health.]

Public Health, Hygiene, Sanitation

88. Discussion of Air Pollution

"The Problem Concerning the Maximum Permissible Content of Harmful Substances in the Environment," by Z. B. Smeliansky, Moscow, Gigiena i Sanitariya, No 11, Nov 57, pp 67-69

The author discusses the problems of air pollution in general terms. He claims that work on maximum permissible doses, which, are much lower in the USSR than in the US, of harmful substances in industry was begun by the USSR in 1927, while the US did not make recommendations concerning industrial air pollution until 1939, and Great Britain even later, 1955.

The author points out that the problem in the USSR is not whether or not the maximum permissible dose should be regulated, but a problem of focusing the forces of physiology, biochemistry, pharmacology, toxicology, and clinical studies on the development of more sensitive and adequate methods for studying the action of external substances which are harmful to the organism.

89. Air Sampling Device Described

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"A New Apparatus for Collecting Air Samples," by R. L. Kotras, Medical Instrument Order of Lenin Plant, "Krasnogvardeyets", Meditinskaya Promyshlennost' SSSR, No 7, Jul 57, p 59

"The Krasnogvardeyets plant has designed and put into mass production aspirator type 822, an apparatus for collecting air samples, which will replace the analogous type A-39 apparatus manufactured in 1954. The latter had a number of deficiencies: it was heavy (12 kg), and the velocity of the air passing through it was measured with rheometers containing kerosene. Practice revealed that the rheometers frequently broke and that the kerosene vapors penetrated into the apparatus, and corroded the rubber tubes which connect the individual cells, thereby putting the apparatus out of commission.

"The new apparatus is designed to collect air samples in industrial and other enclosures for investigative and analytical purposes. The air is passed through special filters and deposits any mechanical or chemical impurities on them. By knowing the volume of air passing through the filters and after determining the amount of the impurities in the air which settled on the filters, the quantity of the impurity contained in a unit volume of air is calculated.

"The apparatus regulates the passage of the air through the filters at different velocities and indicates the air velocity.

"Four samples can be collected simultaneously with the apparatus (Figure 1), two with velocities of 1-20 liters/min, and two with velocities of 0.1-1 liters/min.

"The velocity of the air is measured with rotameters, which are more suited to this type of work than rheometers.

"The rotameters which measure the air at velocities of 1-20 liters/min are calibrated in one liter/min units; the other two rotameters, in 0.1 liter/min units.

"The air passes through the filters due to the action of a rotary-type air impeller which can create an evacuation of 800 ml of water.

"The air impeller is rotated by an asynchronous electric motor with a short-circuited rotor which has a speed of 2,800 rpm and operates on a line voltage of 220 volts.

"The principal electric circuit of the apparatus is shown in Figure 2.

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"To prevent excess evacuation in the pneumatic pump which might overload the electric motor, the apparatus has a safety valve which allows the air when necessary to bypass the rotameters and filters.

"The aspirator is mounted in a metal case with a removable lid which protects it from breakage during transport or during use.

"The outside dimensions of the apparatus are 240 x 192 x 210 mm. It weighs 7 kg."

Figure 1 shows "a general view of the air sampling apparatus."

Figure 2 shows "the principal electrical circuit of the apparatus:

1, the plug; 2, the ground clamp; 3, a PK-45-2 fuse; 4, the electric motor; 5, a push button switch; 6, a rheostat; and 7 and 8, MN-13 electric lights.

90. Aerial Dusting for Extermination of Ticks

"The Long-Term Effect of Exterminating *Ixodes persulcatus* P. Sch. Ticks in Foci Treated With Acaricides, and the Possibility of Using Aerial Dusting," by N. N. Gorchakovskaya, Laboratory of Encephalitides, Institute of Virology imeni D. I. Ivanovskiy, Voprosy Virusologii, No 5, Sep/Oct 57, pp 297-301

This article gives references to work by a number of Soviet authors which demonstrates the efficacy of exterminating *Ixodes persulcatus* ticks by treating natural foci of tick-borne encephalitis with DDT and hexachlorane preparations. It describes testing of these measures in foci of Kemerovskaya Oblast in 1955-1956, during which years no cases of infection among humans were observed. It presents evidence that tick extermination lasted for 2-3 years on the basis of testing (in cooperation with associates of the Parasitology Division of Kuybyshevskaya Oblast Sanitary-Epidemiological Station) of this method of exterminating ticks in deciduous forests in small areas. The author says that two very important points should be considered in selecting a method for tick extermination: (1) the rate at which the original numbers of the vector will be restored, and (2) more economic methods of treating forests. Restoration of tick population was studied in 1954-1956 under industrial conditions in coniferous forests in large areas of Kemerovskaya Oblast by the author and N. K. Preobrazhenskaya, L. I. Dobrynina, and M. P. Bondareva. The article describes methods used in treating areas of Kuznetskiy and Prokopyevskiy rayons.

91. New Insecticide Advertised, but Not Available For Purchase

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"When Will Chlorophos Appear on the Market?" by I. Kudrinskiy, chief physician, City Disinfection Station, Meditsinskiy Rabotnik, 17 Jan 58, p 2

"In the summer of 1957 the Central scientific Research Institute of Disinfection and the Moscow City Disinfection Station conducted tests on a new organophosphorus compound -- chlorophos. They showed the excellent insecticidal properties of the preparation against flies. The effectiveness of chlorophos persisted on the treated surfaces for approximately a month. In spite of its prospects and an urgent need for its rapid introduction into practice, the chemical industry has not yet put it into production. When will chlorophos, the preparation in which disinfection workers are placing great hope, be available?"

92. Use of Water-Soluble Filters in Air Sampling Discussed

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"An Effective Method of Studying the Microflora of the Air," by V. V. Vlodavets, Institute of General and Communal Hygiene, Moscow, Priroda, No 12 57, p 8

"A filter which is soluble in water had already been proposed in the last century for studying microorganisms suspended in the air, but was not generally employed because it was made of Na_2SO_4 , NaCl , MgSO_4 , or sugar. Filters of this kind sharply increased the osmotic pressure in the solution after samples were taken, the filters were dissolved in the water and seeded on nutrient media. As a result of the inhibiting action of the osmotic pressure on the growth and development of bacteria, the cultures grown could be counted only after 9 days instead of 2-3 days when the air is seeded on meat-peptone agar.

"In recent years, new types of soluble filters have been developed which do not have this drawback, i. e., do not bring about a sharp increase in osmotic pressure. The American investigators Mitchell, Timmons, and Dorris, and later Mitchell, Fulton, and Ellingson, developed and perfected the technique of preparing gelatin foam filters soluble in water. Filters of this type were prepared in our country by the Ukrainian scientist A. Ye. Vershigora. Kadzhivara and Samori (Japan) used soluble filters made of sodium glutamate. According to Fyusser's data, sodium alginate did not have any bactericidal or bacteriostatic action in the water with regard to a number of bacteria and brewers' yeasts.

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"After taking a sample of air by aspirating it through a filter, the filter is dissolved in water and the liquid is investigated further. How is this rapid development of the soluble filter method explained? First, the filtration method is one of the most effective methods of collecting microorganisms, since bacteria are retained in large numbers on fibrous or porous filters. Second, the possibility of examining the air for content of filterable viruses, i. e., a new, heretofore unstudied field of air microbiology, arises. Finally, soluble filters can be used for investigating the microflora of the air at below zero temperatures. Most modern methods of investigating the air are based on collecting in liquid or solid culture media (2% agar-agar) and cannot be used at low temperatures because liquid and nutrient agar freeze below -5°C . Therefore, water-soluble filters can be widely employed in bacteriological and microbiological investigations of the atmosphere during the winter in temperate climates, for studying arctic and antarctic microflora, and for studying microflora of the troposphere from aircraft.

"It can be considered that soluble filters made of sodium alginate and sodium glutamate which contain no nutrient material for microorganisms are more suitable; after collecting samples, reseedling is not necessary, since the microorganisms on them do not proliferate. Conditions favorable for proliferation can be established with filters made of gelatin foam due to the effect of moisture accumulated during filtration of the air."

93. Advances in Prevention of Brucellosis

"Prophylaxis of Brucellosis", (Unsigned article), Moscow, Meditsinskiy Rabotnik, 13 Dec 57, p 4

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"The organs of public health of the Russian Federation have achieved considerable success in the control of brucellosis during recent years. Fifteen epidemiological brigades of specialists went into the areas most threatened with brucellosis. They helped the local organs of public health apply antibrucellosis measures. Prophylactic inoculations were given to all persons exposed to infection. Cutaneous revaccination was widely employed for this purpose.

"These measures led to a 33% decrease in the incidence of brucellosis in the Russian Federation for 9 months of the current year in comparison with the same period of last year. Particularly good results were obtained in the Bashkirskaya ASSR, Novosibirsk, Omsk, Kurgansk, Astrakhanskaya Oblast, Stavropol'skiy Kray, and the Dagestanskaya ASSR."

94. Air Pollution Control in Sverdlovsk

"Air Protection -- A Matter of Concern," by V. Kazak, state sanitary inspector for air pollution, Moscow, Meditsinskiy Rabotnik, 3 Jan 58, p 3

The author describes the work being done by the industries in the city of Sverdlovsk on the control of air pollution, and makes suggestions for the improvement of the program.

The author says that eight enterprises in Sverdlovsk installed ash recoverers in 1953 and 1954, but an evaluation of their technical feasibility and effectiveness cannot be determined owing to the lack of a laboratory and of a proper organization for inspection and control. He adds that some directors of industry are disrupting the program and should be fined for continuing to pollute the air.

The author contends that the Main State Sanitation Inspectorate is not energetic enough in presenting the problems, i. e., a better and simpler method of approach to the air pollution problem, to scientific, experimental, and design institutes. He says that, since other areas have the same problem, a special group should be established soon for planning the control of air pollution, and a factory established for the production of the necessary equipment for this control. Finally, the author suggests that air pollution laboratories should be established in the sanitary epidemiological stations.

95. Training in Handling Radioisotopes in Yugoslavia

"Danger Without Taste or Smell," by S. Tadic, Belgrade, Borba, 15 Dec 57, p 9

The "Boris Kidric" Institute of Nuclear Science (Institut za nuklearne nauke "Boris Kidric") in Vinca has been conducting a training school in the handling of radioisotopes for about a year. The industrial application of radioisotopes began in 1954 with the use of irridium 192 and cesium 137 by the "Metalna" Factory. The first photographs taken with the aid of gamma rays from irridium 192 were used for controlling the quality of the water conduits for the Vrla I Hydroelectric Plant.

The school, originally established for the institute's own benefit, has been opened to personnel from other establishments and enterprises. About 105 persons attended the school in 1957, but many others were refused for lack of facilities. About one third of the students have doctor's degrees in various fields. They are taught in groups of 12-14 students by about 30 teachers for 7-8 weeks. The teaching is not specialized, but covers all aspects of handling isotopes, from the study of radiation effects on living organisms to defectoscopy.

This training will not be limited to professional personnel, but seminars will be organized for skilled, semiskilled, and unskilled persons who must handle radioisotopes.

Most of the equipment used for school purposes was built by the institute itself, and this experience will be available to industry as it provides itself with similar equipment.

In 1958, about 130 persons will receive training in this school.

96. Hungarian-Yugoslav Health Agreement

"Hungarian-Yugoslav Health Agreement Signed" (unsigned article), Budapest, Esti Budapest, 22 Nov 57, p 1

Hungary and Yugoslavia have concluded an agreement concerning the prevention and control of contagious diseases. The public health organs of the two countries will exchange information pertaining to the treatment and control of contagious diseases at both practical and research levels. The two countries have also agreed to cooperate in preventive and therapeutic measures along their mutual frontier.

97. Birth Control to Reduce Legalized Abortion in Hungary

"Physicians -- About a Hushed-Up Problem," by Odon Balla, Budapest, Nepakarat, 23 Nov 57, p 2

A lecture on abortion and birth control was delivered on 22 November at the No 1 Clinic of Gynecology, Budapest Medical University. Dr Endre Bencze, head physician, said that the number of abortions in the nation has increased to 4,000-5,000 per month. Other topics covered in the lecture dealt with contraceptive preparations and devices and their use.

Immunology and Therapeutics

98. Effect of Synthomycin on Coagulation Time Studied

"Observations on the Coagulation Time of Typhoid and Paratyphoid Patients Treated With Synthomycin," by M. V. Nevskiy, Tr. Kliniki infekts. bolezney. Tashkentsk. Med. In-t, works of infectious disease clinic of the Tashkent medical institute, 1955, Tashkent, Academy of Sciences Uzbek SSR, 1955, pp 39-40 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 57, Abstract No 53624, by Ye. G.)

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"In typhoid and paratyphoid cases, the coagulation time of a majority of the patients (of 75), who were being treated with synthomycin, was moderately reduced during the entire course of the disease. Maximum decrease in coagulation time was observed during the period when the disease symptoms began to disappear."

99. Treatment of Experimental Brucellosis

"Therapy of Experimental Brucellosis, Report III. Serum Therapy," by G. A. Balandin, N. P. Prostetova, and Z. D. Khakhina, Trudy Rostovskogo Gosudarstvennogo Nauchno-Issledovatel'skogo Protivochumnogo Instituta (Works of the Rostov State Scientific Research Antiplague Institute), No 9, 1955, pp 166-178 (from Referativniy Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 73169, by M. A. Gruzman)

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"The therapeutic effect of Uvarov's serum (SU) in experimental brucellosis of guinea pigs was tested. This serum, according to Uvarov, is a combination of Bogomol'yets' ACS (non-species-specific) with antibacterial antibrucellosis serum. The pigs were infected with a 2-day agar culture of Br. melitensis. Su was given to one of the pigs according to Uvarov's schedule immediately after infection, and to the others, 17 or 33 days after infection. There was no therapeutic effect. The erythrocyte sedimentation reaction to infection and to the introduction of SU was studied with the help of skin tests according to the Leshchinskiy-Kavetskiy method, and monocytes in the peripheral blood were determined. Infection suppressed the erythrocyte sedimentation rate; SU not only did not accelerate the erythrocyte sedimentation rate but considerably inhibited it. Extensive hemorrhagic edematous areas were observed in all guinea pigs at the site in to which the serum was introduced."

100. Reinfection of Sheep Which Have Recovered From Brucellosis

"Verification of Immunity by Repeated Infection of Sheep Which Have Recovered From Brucellosis," by P. P. Samoylov, Trudy Dagestanskogo Sel'skhokhozyaystvennogo Instituta (Works of the Dagestan Agricultural Institute), No 8, 1956, pp 75-78 (from Referativniy Zhurnal -- Biologiya, No 17, 10 Sep 57, Abstract No 73167, by M. Ya. Boyarskaya)

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"The status of immunity was examined 14 1/2 months after infection in five sheep which had recovered from brucellosis and had lost serological and allergic reactions. Experimental and healthy control sheep were infected seven times with an infecting dose of a virulent strain of *Brucella melitensis*. Complement fixation and positive allergic reactions appeared in the experimental sheep on the 17th day after infection. Control sheep aborted on the 26th and 33d days after infection, and a culture of *brucella* was isolated from the fetuses. Pathological-anatomical dissection of the five reinfected sheep did not establish any changes suggestive of brucellar infection. Bacteriological seedings and biological tests on guinea pigs were found to be negative. In the author's opinion, the results of the experiments substantiated the efficacy of prophylactic vaccination of sheep against brucellosis."

101. General Principles in the Treatment of Lesions Caused by Radioactive Substances

"General Principles in the Treatment of Lesions Caused by Radioactive Substances," by V. A. Sanotskiy, Meditsinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 14-22

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"If radioactive substances are introduced into an organism, first aid and further treatment of the developing radiation sickness present great difficulties. This is due especially to the fact that the radioactive substances are present in the body as constant irritants maintaining the process.

"Among the measures which may and should be recommended in such cases are those which increase the rapidity of elimination of the 'toxin' from the body. The quicker and the better these measures are conducted the more chances there are for success. All possibilities to strengthen the organism, to increase its vitality, and to re-establish its reactivity up to the normal level should be applied. Measures of pathogenic significance and symptomatic treatment should be undertaken.

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"Definite success in the therapy of lesions caused by radioactive substances may be attained if the treatment is well organized. Various treatments should be applied simultaneously, in proper sequence, and as early as possible." -- English abstract

CPYRGHT

102. Preliminary Active Immunization Against Intestinal Infections Favorable for Animal Radioresistance

"The Influence of Active Immunization Against Intestinal Infections and Tuberculosis on Radiosensitivity of Animals." by N. N. Klemparskaya, V. F. Sosova, O. R. Nemirovich-Danchenko, and G. M. L'vitsina, Meditinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 65-72

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The authors make the following conclusions:

1. "Preliminary single immunization of mice by tetravaccine increases their survival after irradiation by X rays (400 r) and increases the span of life after intoxication by polonium.

2. "Preliminary repeated vaccination, three times, of rabbits doubles survival after irradiation by 800 r of X rays, and delays the appearance of leukopenia.

3. "Intracutaneous vaccination by BCG vaccine increases the percentage of survival of guinea pigs irradiated by 200 r of X rays if vaccination is performed 2 or more weeks before irradiation." -- English abstract

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103. Effects of Ionizing Radiation on Infection and Immunity Studied

"Certain Experimental Results From the Study of the Effect of Ionizing Radiation on Infection and Immunity," by P. N. Kiselev, Bacterioserological Laboratory (head, Prof P. N. Kiselev) Central Scientific Research Roentgenoradiological Institute, Ministry of Health USSR, Meditinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 55-64

"Experimental data which characterize the disturbance of immunity and the rules governing the development of infectious processes in acute radiation sickness were analyzed in this paper. Results indicate the great significance of prophylaxis, diagnosis, and therapy of infectious diseases in irradiated organisms for the understanding of the pathogenesis of radiation sickness." -- English abstract

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Internal Medicine

104. Antithyroid Preparations Prevent Development of Shock-Hemorrhagic Condition Due to Nerve Trauma

"The Influence of Methylthiouracil on Shock-Hemorrhagic Condition Developing Under the Influence of Nerve Trauma," by L. P. Dobrokhotova, Moscow State University imeni M. V. Lomonosov, Doklady Akademii Nauk SSSR, Vol 114, No 6, 21 Jun 57, pp 1320-1321

Trauma produced by sound stimulation decreased the blood pressure of 205 experimental rats. Pronounced nerve injury was evident, such as paresis, paralysis, nystagmus, epiphora, and areflexia. Male rats were more susceptible than female rats, and castration increased their survival chances. Parathyroidectomy intensified the development of shock-hemorrhagic condition. The death ratio of experimental rats under hyperthyroid condition was eight times that of normal animals. Rats to which methylthio-uracil, an antithyroid substance, was administered survived the influence of nerve trauma better than control animals, and the death ratio was 6% in the former as compared with 16.2% in the latter, or control animals.

The author stresses the functional significance of the thyroid gland in the development of shock-hemorrhagic conditions, and points to the possibility of using antithyroid preparations for preventing the development of shock-hemorrhagic conditions.

105. Darydag Arsenic-Containing Water Tested as Treatment for Anemia

"Change in Blood Composition in Previously Anemized Animals Under the Influence of Darydag Arsenic Water and Arsenic Solution," by G. A. Guseynov, Uchenyye Zapiski Azerbaydzhan-skogo Gosudarstvennogo Universiteta imeni S. M. Kirova, (Scientific Notes of the Azerbaydzhan State University imeni S. M. Kirov), No 1, 1957, pp 85-98

Studies were made of changes in blood composition of previously anemized animals under the influence of Darydag arsenic water. The studies were conducted to determine the feasibility of using Darydag arsenic water as a therapeutic agent in various forms of anemia.

After experimental bloodletting in the amount of 30% of the circulating blood, it takes more than 40 days for the blood to return to normal.

Administration of Darydag arsenic water in the amount of 10 cc per kg body weight to anemized rabbits results in complete restoration of the initial erythrocyte and hemoglobin levels by the 15th day of treatment. By the 25th day the initial levels are exceeded.

Neurology and Psychiatry

106. Neurology Institute Under Academy of Sciences Georgian SSR Opened

"New Institute in Tbilisi" (unsigned article), Moscow, Meditsinskiy Rabotnik, 17 Jan 58, p 1

A new Institute of Clinical and Experimental Neurology of the Academy of Sciences Georgian SSR (Institut Klinicheskoy i Eksperimental'noy Nevrologii) was recently opened in Tbilisi. Prof P. M. Saradzhishvili is director of the institute.

The institute has a clinic of 110 beds and the following subdivisions: Neurology Division (Nevrologicheskiy Otdel), Neurosurgical Division (Nevrokhirurgicheskiy Otdel), Neuromorphological Laboratory (Nevromorfologicheskaya Laboratoriya), Biochemical Laboratory (Biokhimicheskaya Laboratoriya), Electrophysiological Laboratory (Elektrofiziologicheskaya Laboratoriya), Experimental Laboratory (Eksperimental'naya Laboratoriya), and Radiological Laboratory (Radiologicheskaya Laboratoriya).

Pharmacology, Toxicology

107. Blastomogenic Effect of Radioactive Strontium (Sr⁹⁰) Discussed

"Blastomogenic Effect of Radioactive Strontium (Sr⁹⁰)," by N. A. Krayevskiy and N. N. Litvinov, Meditsinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 33-39

The authors review the blastomogenic effects of radioactive strontium under experimental conditions. Radioactive strontium is a most powerful radioactive agent in producing osteogenic sarcomas and leukemias. The latent period for the development of Strontium-induced tumors is in reverse ratio to the dose of radioactive substance, and varies in different animals. The period for development, number, and location of tumors and the severity of the animals' conditions depend on the condition of the animal at the moment of radiation effects and on the age of the animal. The distribution of radioactive strontium differs with age of animal.

The appearance of tumors is preceded by a prolonged latent period during which changes in bone tissue occur. Most frequent sites of skeletal tumors are zones of growth, and where the largest amounts of the radioactive substance is fixed. Tumors induced by radioactive strontium do not differ structurally from tumors caused by other agents or those arising spontaneously.

Leukemias resulting from the effects of radioactive strontium belong to the reticular and hemocytoblastic type, or those accompanying tumor growths.

108. New Method of Determining Activity of Biogenic Stimulators

"A New Method for Determining the Activity of Biogenic Stimulators," by V. S. Komareva, Nekotoriye Voprosy Farmatsii (Certain Pharmaceutical Problems), Kiev, Gozmedizdat, 1956, pp 344-347 (from Referativnyy Zhurnal -- Biologiya, No 18, 25 Sep 57, Abstract No 80558, by O. A. Chaykina)

Blood extracts of typhoid, typhus, and dysentery patients were prepared according to the method employed by the Institute of Eye Diseases imeni V. P. Filatov. The determination of biogenic stimulators in the patients' blood was conducted by calculating the activity of *Penicillium crustosum*. It was shown that the stated method permits the detection of biogenic stimulators in blood extracts and the determination of their activity during various stages of a disease.

109. Toxic Effects of Sulfur Dioxide Examined

"The Effect of Sulfur Dioxide on an Organism," by N. V. Volkova, Tr. Leningr. san.-gigien. In-ta. (Works of the Leningrad Sanitary Hygiene Institute), 1956, No 26, pp 59-85 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 57, Abstract No 53710, by V. K.)

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"The effect of SO_2 on the conditioned reflex activity (CRA) and respiration of rats was studied. It was shown that the minimum concentration of SO_2 which produces disruption in CRA is between 3 and 7 mg/m^3 . A concentration of 20 mg/m^3 of SO_2 produces serious disruption in the CRA beginning with the first day of exposure, and expresses itself by a persistent lowering of cortical stimulation, until conditioned reflexes disappear due to an increase in the latent period (in some experiments up 59 3 and 31/2 times more); the mean increase in the latent period was doubled with partial disruption of differentiation. Changes in the respiratory function were observed from the beginning of the experiment, beginning with 2 mg/m^3 of SO_2 in which case there was

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increased deep breathing accompanied by an obvious predominance of inspiration. In the case of the chronic action of 5 mg/m^3 of SO_2 primary changes in the positive latent period began 5-6 days after exposure; the latent period of the conditioned reflexes was increased 2 to $2 \frac{1}{2}$ times in some experiments; in addition to an increase in the latent period a partial decrease in CRA was observed; disruption of differentiation was not observed. The chronic action of 2.5 mg/m^3 SO_2 did not produce any effect on conditioned reflex activity; the latent period, as a result of this exposure, was not changed, and disruption of differentiation was absent. The author thinks that the 20 mg/m^3 concentration of SO_2 , which has been established by GOST as the permissible limit for the air in factories, cannot be disregarded."

110. Review of Ganglion-Blocking Substances

"Ganglion-Blocking Substances," by P. Denisenko, scientific associate, Institute of Experimental Medicine, Department of Pharmacology, Moscow, Meditsinskiy Rabotnik, 17 Jan 58, p 2

After explaining the mechanism of acetylcholine inhibition, the author describes the physical, chemical, and clinical characteristics of ganglion-blocking substances which have been studied extensively and are commercially available. The author places special emphasis on the hexone group (iodo; chloro; bromo; benzolsulphoxo-, etc. Their synonyms, are C-6, hexatonid, hexamethonium, hexacid, mezium, hexamethon, ezomide, bistrum, and others. In addition, the author briefly describes pentoliny (pentapyrrolidin, anzolizen), pentamine (pendiomide, azomethonium, ciba 9295), tetamon - I (tetramethylammonium iodine), pachycarpine, nanophin, diochine, dicholine, mekamine (mevazine, inversine), arphonad, and ekolide, a preparation not manufactured in the USSR and whose therapeutic value is unknown.

The author points out that there is much to be learned about the action of ganglion-blocking preparations, and that their most practical application is in pharmacological denervation affording temporary protection from pathological impulses.

111. Heavy Metal Poisoning Therapy Discussed

"Acute Poisoning With Nickel Carbonyl," by S. N. Sorinson, Candidate of Medical Sciences; Moscow, Gigiena i Sanitariya, No 11, Nov 57, pp 30-36.

The author reports ten cases, seven acute and three mild, of poisoning due to nickel carbonyl vapors. The clinical picture, characterized by diffuse focal pneumonia with peculiar roentgenological changes, fever,

and pronounced respiratory deficiency, was described, as was the course of therapy which included 50% oxygen, norsulphazol, penicillin, glucose, calcium chloride, ascorbic acid, camphors, adonidin, bromides, and morphine for pain relief. The treatment proved successful in all cases. One acute patient was treated with a new antidote preparation, unithiol, an analog of dimercaptopropenal (BAL), and the results were so good that that author recommends its utilization from the very onset of future cases. The author also suggests, as in analogous cases with the poisons of the phosgene group, that a bed regime be followed and the patient be kept warm at the first hint of intoxication.

112. Physiological Effects of Chlorine Inhalation Determined

"Increase in Vascular Permeability During Short and Prolonged Exposure to Chlorine," by M. B. Mogil'nitskiy, Ocherki po Sosudistoy Pronitsayemosti (notes on vascular permeability), Moscow, Medgiz, 1956, pp 243-271 (from Referativnyy Zhurnal -- Biologiya, No 12, 25 Jun 57, Abstract No 53704, by S. Sh.)

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"In a 250 liter static exchange chamber, dogs and rabbits were subjected to chlorine exposure (1.16 mg/liter for 15-60 minutes). The animals died 15 minutes to 28 days after exposure. Changes in capillary and vascular permeability were studied with the aid of morphological investigations, roentgenocardiographic studies according to a method by P. N. Mazayev, and live staining method with trypan blue. Short acute exposures produced a sudden expressed progressive increase in the permeability of the capillaries and small vessels along with a preliminary action of the gas on the upper respiratory tract, the lungs, and skin, and in other organs, the heart, liver, kidney, and brain. Increased permeability was accompanied by degenerating destructive changes in the walls of the vessels and parenchymatus tissue of the internal organs, and in particular there was lowering of the impregnability of the argylophilic fibers of the basal membrane vessels and the argylophilic carcass of the parenchymatus organs. Repeated exposure of chronically diseased vessels resulted in the sclerotization of these same vessels as well as of the surrounding connective tissue. Usually, swelling, loss of structure, and homogenization of the connective and muscle fibers presented a picture of fibrous necrosis. Bronchitis, bronchiolitis, bronchiectasis, serous desquamated giant cells, catarrh pneumonia, obliteration of the small bronchi, and preliminary forms of pneumosclerosis were observed in the lungs. The author believes that the basis for the pathological process following chlorine exposure is increased capillary permeability accompanied by a decrease in the argylophilic properties of the argylophilic fibers."

113. Chinese Compare Effects of Thiamine and Reversibly Anticholinesterase-Active Neostigmine on Interoceptive Reflexes

"The Influence of Vitamin B₁ and Neostigmine on Some Interoceptive Reflexes," by Shen Chi-ch'un (沈其春), Liu Shih-wei (刘世伟), and Man Chung (满忠), Shanghai, Sheng-li Hsueh-pao (Acta Physiologica Sinica), Vol 21, No 3, Sep 57, pp 265-273

This paper presents the details of controlled, physiologic experiments undertaken to observe the effects of thiamine and neostigmine on the interoceptors of certain isolated perfused organs of cats and dogs and their influences on interoceptive reflexes.

The authors say that their interest in thiamine is due to its role in the humoral regulation of the nervous system and to its anticholinesterase action. Their interest in neostigmine for its anticholinesterase action is implied. The vitamin B₁ used in their study was thiamine HCL manufactured by the Shanghai Branch of the China National Pharmaceutical Corporation.

It was found that thiamine in large amounts (20-30 mg/kg body weight) caused a fall in arterial blood pressure and death of small animals, as reported by Hecht and Weese, and that the depressor action was definitely a central effect. Conversely, the vitamin administered in small amounts (2-100 milligrams) caused increased arterial blood pressure and respiration on stimulating the chemoreceptors in isolated perfused organs and in carotid and aortic bodies in vivo. Moreover, after the passing of these reactions, the chemoreceptor reflexes elicited by subsequent acetylcholine and paranitrophenol injections were enhanced. Slow, continuous intravenous infusion of thiamine first exaggerated and then diminished the depressor-reflexes of the carotid sinus, but exaggerated without subsequently diminishing the chemoreceptor reflexes of the carotid body.

It was found that neostigmine administered in small amounts (0.25-0.5 milligram) produced the same enhancing effect on chemoreceptor reflexes as did small amounts of thiamine, but with no apparent stimulation of the chemoreceptors. It caused a marked exaggeration of the depressor reflexes of the carotid sinus, the effect being similar to that produced by eserine, as reported by Vander-Linden and Vercauteren.

The article discusses the anticholinesterase action of both thiamine and neostigmine and the reversibility of the latter's anticholinesterase action, which makes it useful in medicine as a protector of the enzyme. The reported use of neostigmine in combination with atropine against parathion poisoning in experimental animals is cited, and the possibility that thiamine may also be used to prevent poisoning is considered.

114. New Hungarian Drugs

"New Hungarian Drugs" (unsigned article), Budapest, Nepa-
karat, 22 Sep 57, p 12

The United Pharmaceutical and Nutriment Factory, Budapest, is producing a new local anaesthetic named Lidocain, which is said to take effect in 1 1/2-2 minutes and can be used safely on patients who are allergic to novocaine.

Another new drug, Enteroseptol, is used in combating intestinal infections. It replaces a similar preparation which was formerly imported.

Although the factory produces 48 types of preparations, few of them reach the pharmacies, because the factory lacks ampules, tubes, cartons, and labels.

Radiology

115. Achievements of 40 Years of Soviet Medical Radiology Reviewed

"Forty Years of Soviet Medical Radiology," by Prof M. N. Pobedinskiy, Meditsinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 5-14

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"Achievements of Soviet radiology for the past 40 years are reported in this paper. Extensive therapeutic research and organization work is being carried out in the field of medical radiology. This work has been broadened during the last few years since the advances of Soviet physics and chemistry gave the opportunity to introduce new sources of ionizing radiation into numerous branches of medicine. Recently, in connection with numerous investigations in medical radiology extensive work was conducted in training doctors and medical personnel in this field of medicine." -- English abstract

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116. Ionizing Radiation Begins With Deleterious Effects on the Receptor Apparatus and Terminates With Injuries to the Cerebral Cortex

"Histopathology of the Nervous System at Various Periods of Experimental Acute Radiation Sickness," by A. G. Beglaryan, K. A. Kyandaryan, and S. A. Papoyan, Scientific Research Institute of Roentgenology and Oncology, Ministry of Health Armenian SSR, Doklady Akademii Nauk SSSR, Vol 112, No 3, 21 Jan 57, pp 422-424

The purpose of the present research was to refute the erroneous conception that the nervous system is unchanged by radiation.

Tests were conducted on rabbits which were exposed to single total X-irradiation by 1,000 r and partial gamma irradiation of the brain by average doses up to 50,000 r. This brought about the classical picture of acute radiation sickness, and the experimental animals died at various periods after irradiation.

Effects of ionizing radiation evident during the initial and latent periods indicated dystrophic changes in the nerve fibers and the myelin sheath, such as vacuolization and central or total chromatolysis. During the peak of radiation sickness, the changes were of the nature of cyto-architectonic disturbances. Pyramidal cells of the cortex were seen in a shriveled state; and hydropic dystrophy and karyocytolysis were evident.

On the whole, during the initial and latent periods, injuries were concentrated in the visceroreceptor apparatus, and in the afferent neurons, while during the peak of the disease pathological changes became evident in the lateral horns of the spinal column, the dorsal nuclei of the medulla oblongata, and in the hypothalamic region. Gradually these pathological processes diffuse and pass into the motor pathways, and gradually all the links of the reflex arc become involved, and finally the links between the central and peripheral nervous system are destroyed.

These disturbances later become evident in disturbed cardiac rhythm, disturbed secretory and motor functions of the gastrointestinal tract and the development of its paralytic obstruction, etc.

Therefore, the authors conclude that these histomorphological studies on animals subjected to experimental acute radiation sickness confirm that a number of serious changes occur in various branches of the nervous system, starting with the receptor apparatus and terminating with the cerebral cortex.

117. Evidence of Toxic Properties of the Blood of Irradiated Animals in Experiments on Adrenalectomized Animals

"Concerning the Problem of the Appearance of Toxic Properties of Blood of Irradiated Animals in Experiments on Adrenalectomized Animals," by P. D. Gorizontov, and S. A. Davydova, Meditinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 51-55

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"Toxic properties in the blood of irradiated animals became evident in experiments using cross circulation. The effect of blood serum of irradiated and normal animals on the mortality rate of rats and mice was studied in a series of experiments. Preliminary bilateral removal of the suprarenal glands was performed in rats and mice.

"The authors make the following conclusions: (1) Blood serum obtained from animals irradiated by ionizing radiation in large doses, becomes toxic, to adrenalectomized mice and rats. (2) The blood of irradiated rats and dogs during the first 24 hours after irradiation is not toxic; it even retards the death of adrenalectomized mice." --

English abstract

118. Cancerogenic Properties of 15 Radioactive Isotopes Analyzed

"Radioactive Isotopes as Cancerogenic Agents," by V. N. Sterel'tsova and Yu. I. Moskalev, Meditinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 39-51

The present report is devoted to the comparative analysis of the cancerogenic effects of 15 radiative isotopes and elements differing in their physical properties, and distribution in an organism. These includes radioactive strontium⁸⁹, strontium⁹⁰, and mixture of radioactive strontium⁸⁹⁺⁹⁰, barium¹⁴⁰, radium²²⁶, yttrium⁹⁰, and yttrium⁹¹, mixture of beta emitters, cesium¹³⁷, calcium⁴⁵, niobium⁹⁵, cerium¹⁴⁴, promethium¹⁴⁷, lanthanum¹⁴⁰, ruthenium¹⁰⁶, and plutonium²³⁹.

Various diagrams represent the general characteristic of the distribution of these radioactive elements in various body organs and tissues, and the effects of these isotopes following parenteral administration. Two tables represent the relationship between the value of active Nb⁹⁵ administered, to the frequency of tumors, and the dose of Cs¹³⁷ to the frequency and localization of tumors.

The distribution of an isotope has no qualitative effect on the appearance of the tumors of the mammary gland or on leukemias. Leukemias induced by radioactive isotopes range from 3 to 10 percent of cases.

119. Sequelae of the Precipitation of Radioactive Strontium Isotopes Discussed

"Concerning the Problem of the Sequelae of the Precipitation of Radioactive Isotope of Strontium (Sr⁹⁰)," by A. V. Lebedinskiy, Meditinskaya Radiologiya, Vol 2, No 5, Sep/Oct 57, pp 22-23

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"The study of the problem of precipitation of the radioactive isotope of strontium (Sr^{90}) is of special importance in evaluating the consequences of atomic tests on the health of mankind. Calculations of the possible values of precipitations in the future years are especially important.

"Such calculations are made on the base of supposed even precipitation of Sr^{90} , existence of optimum relations between the content of calcium and strontium in the soil, as well as high "protective coefficient." Data demonstrating unreliability of such calculations are presented. It is particularly pointed out that preliminary determination of the "protective coefficient" is required in the most important case of saturation of Sr^{90} by the organism at the periods of foetal skeletal formation and development of the skeleton in newborn infants. In these conditions, Ca is deficient, and therefore, the "protective coefficient" is expected to be low. The routes of migration of Sr^{90} in the following sequence should be thoroughly studied: the mother's organism yields Sr^{90} in the mother's blood which passes to foetus and animals milk, to the mother's organism, to the mother's milk, and then to the newborn infant." -- English abstract

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Space Medicine

120. Medical Problems of Space Flight Discussed

"Man and Cosmos," by A. Aleksandrov, Meditssinskiy
Rabotnik, No 105 (1644), 31 Dec 57, p 3

CPYRGHT

"Since the firing of Soviet artificial earth satellite, interplanetary travel has moved from the world of scientific myths, fiction, and fantasies to the realm of reality....

"On 4 October 1957, the entire scientific world heard signals from the first Soviet artificial earth satellite. Those signals proclaimed the beginning of the era of space travel. Thereafter, the Soviets put aloft the second artificial earth satellite carrying not only experimental instruments, but also a living organism, a dog.

"Scientists have been watching the behavior of the animal in the hermetic chamber and the readings of instruments measuring pulse, blood pressure, and respiration. Those recordings represent reactions to physical and biological conditions which humans will have to endure when scaling through space to great heights. This is important because the ultimate aim of all rocket launchings, of all artificial earth satellites, and of all explorations of upper regions of atmosphere, stratosphere, and interplanetary space is to have humans travel safely from one planet to another at some future time.

"In launching the two artificial earth satellites, the Soviet engineers and technicians solved an imposing problem: for the first time in the history of mankind a man-made missile went many kilometers beyond the atmosphere surrounding the earth.

"But before man can think seriously of journeying into outer space, difficult problems will have to be solved. Those problems involve not only technology, but also medicine and biology.

"Physiology and medicine accompany man everywhere in his attempts to overcome nature. Aviation medicine has grown immensely and has strengthened its position as a branch of science and has given rise to a new science: space medicine. The importance of astrobiology is gaining momentum. Astrobiology is a theory of adaptation of a living organism to new, cosmic dimensions of technology and new methods of travel; it concerns itself with organic life in astral domains.

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"At the time when scientists are planning future interplanetary missiles and cosmic vehicles, physiologists, biochemists, and hygienists are getting ready, if not to accompany, at least to provide the early stratosphere navigators with safety devices...

"A man flying into space must have hygienic living conditions devised for him; he must have protection against falling barometric pressure and oxygen deficiency as well as zero temperature. He will take off in a hermetic, well insulated cabin with a regenerating air supply system. It is possible that in the course of protracted flight carbon dioxide will be removed not with the aid of chemicals, but by means of photosynthesis of certain plants. Algae and cultures of melons are the best sources of oxygen in outer space. The spaceman can be protected by a special altitude helmet or special altitude suit. The special suit must be reliable enough to protect the spaceman during take off and in case something goes wrong with the hermetic cabin....

"Tsiolkovski suggested that man be submerged in a bathtub of water just before take off in a rocket. A water suit invented for aviators was based on that theory. It has been recently proven that a simple aerial G-suit is sufficient. It exerts pressure on the tissues of the lower half of the body thus preventing disturbances in cerebral blood circulation. Further protection can be provided by having the body in a position perpendicular to the axis of the rocket. Systematic conditioning makes it possible for flyers to withstand 12-13 times as much acceleration for 3-4 minutes without ill effects.

"Experiments with animals showed that a brief, 20-30 seconds, stay in a state of weightlessness produces no material changes in respiration and heart activity. One experimenter, making a study of the effects of weightlessness, came to the conclusion that it was a good form of rest. In any case it has been proven that man is able to adjust himself to condition of weightlessness for a brief period of time. It may be possible to compensate for the gravitational pull of the earth by resorting to centrifugal force.

"There are two more serious dangers a man will face in his travels through space. One of them is cosmic radiation. The degree of danger presented by particles having colossal energy in interplanetary space is now being ascertained by experimenting with animals. Meteorites present a real problem because of their immense penetrating force. Even a small meteoric particle, weighing only one gram, can dislodge up to 5 kilograms of material from the metallic casing of a space craft....

"The most important problem is reentry. Humans will be sent into outer space only when this problem is solved.

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"Reliable scientists are not inclined to be too enthusiastic nor are they disposed to exaggeration. Their estimate, that the first attempts to get to the moon will be made within a few years, can be accepted without any reservations. One or two stages must be added to perfect a modern ballistic rocket to the point where it can be made to travel 12 kilometers per second. Such speed is sufficient to reach the moon.

"At the last international congress on astronautics one scientist stated that travel from earth to Venus and Mars will be possible by 1971.

"Serious scientists and engineers are considering utilizing solar radiation as a source of energy for interplanetary vehicles. A scheme is being developed for a rocket with a photon motor. If scientists succeed in developing such a motor, man will be able to move all over the universe at the speed of lightning....

"Since time immemorial men have dreamed of exploring space. Drawn by a curious fascination for flight, many prophets arose to foretell the blessings and calamities that such attempts would bring to mankind. Jules Verne was the first to come forward with the idea of converting instruments of destruction into instruments for the scientific exploration of the cosmic depths. Konstantin Eduardovich Tsiolkovskiy, the founder of astronautics, said that Jules Verne's novels supplied the spark that stimulated his thoughts."

121. Visual-Motor Reaction Time and Light Sensitivity Corelated

"On the Relation Between the Speed of Visual-Motor Reactions and Light Sensitivity," by T. N. Ushakova, Institute of Psychology, Academy of Pedagogical Sciences, RSFSR, Moscow, Voprosy Psikhologii, No 1, 1957, pp 97-106

CPYRGHT

"Since the number of publications devoted to the study of factors influencing various types of sensitivity is very large and since all those studies were conducted when the study of speed reactions also attracted great interest, sensitivity is beginning to be used more and more as an indicator of various aspects of human mental activity."

The author states that evidence collected as result of experiments with six adults was sufficiently well-defined to support the conclusion that there is a functional relation between the speed of visual-motor reactions and light sensitivity which can be most easily understood from the point of view of physiological law of force.

CPYRGHT

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121. Visual-Motor Reaction Time and Light Sensitivity Correlated

"On the Relation Between the Speed of Visual-Motor Reactions and Light Sensitivity," by T. N. Ushakova, Institute of Psychology, Academy of Pedagogical Sciences, RSFSR, Moscow, Voprosy Psikhologii, No 1, 1957, pp 97-106

CPYRGHT

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The author states that evidence collected as result of experiments with six adults was sufficiently well-defined to support the conclusion that there is a functional relation between the speed of visual-motor reactions and light sensitivity which can be most easily understood from the point of view of physiological law of force.

In conducting this study it was assumed that the difference in time of motor reactions, during the irritation of various points of the visual apparatus with light is connected with the distribution along the retina of the eye of elements which are sensitive to light. The time of reactions is of shorter duration in those places where the elements are situated more densely and where sensitivity is higher and vice versa.

It can be noted that results obtained in this investigation confirm the conclusion reached as result of previous experiments. This conclusion asserted that "a relationship existed between acuteness of vision and the speed of visual-motor reactions, between acuteness of vision and light sensitivity, and between all three."

122. Gravity and Size Illusions Investigated

"On the Mechanism Underlying the Formation of Gravity and Size Illusions," by L. A. Venger, Pedagogical Institute imeni S. M. Kirov, Leninabad, Vorposy Psikhologii, No 1, 1957, pp 88-96

The author presents the results of an investigation of gravity and size illusions. A gravity illusion is a phenomenon which occurs when, after repeated use of two objects of unequal weight, two objects of equal weight seem unequal. When assimilative illusion occurs, the person perceives that an object is heavier in that hand which previously held a heavier object. When a contrasting illusion occurs, the reverse is true.

A size illusion consists of the inadequate perception of two figures equal in area after repeated perception of two figures similarly arranged but unequal in area. Whether the illusion formed is assimilative or contrasting depends on the size of objects and the number of exercises.

These illusions and analogous illusions of volume, pressure, intensity of illumination, etc., were studied for many years by Academician D. N. Uznadze and are being studied today by his students and coworkers at the Institute of Psychology of the Academy of Sciences, Georgian SSR (R. G. Natadze, I. T. Bzhalava, N. G. Adamishvili, B. I. Khachapuridze, and others). They have collected a vast amount of data on the formation and extinction of illusions and on the conditions which cause them.

On the basis of an analysis of the two illusions under discussion, D. N. Uznadze advanced the concept of attitude. He looked upon an illusion as the result of the action of a fixed attitude. In connection with this, all peculiarities of formation, appearance, and disappearance of illusions may be looked on as a peculiarity of attitude.

The author describes recent research carried out to verify experimentally to what extent the concept of attitude was necessary in order to explain the formation of illusions of gravity and size, and to offer an analysis of the process of formation and appearance of these illusions from the point of view of I. P. Pavlov's theory. Pavlov claimed that an illusion was formed due to the appearance of a sensory conditioned reflex.

The author thinks that an explanation of gravity and size illusions does not require the attitude concept. Consequently, experiments with these illusions and illusions similar to them do not constitute adequate bases for advancing this concept.

123. Medical Problems of Space Flight Discussed

"Science and Technology. On the Road to Interplanetary Flights," by V. Malkin, Candidate of Medical Sciences, Sovetskaya Aviatsiya, No 261 (2819), 3 Nov 57, p 4

Up to the time of launching of an artificial earth satellite research in various fields of science was conducted under laboratory conditions. This contributed greatly to the development and testing of various methods of protection for animals and people exposed to conditions of rarefied atmosphere, cosmic radiation, acceleration, and weightlessness. Among the methods of protecting animals that will make flights into outer space or into orbit in an artificial earth satellite are sealed cabins containing equipment regenerating air supply and altitude helmets or high altitude suits which create specific pressure on the body and supply oxygen to the animal in case the cabin becomes unsealed. (Figure 1 shows dog in a high altitude suit.)

Attempts to learn the effects of cosmic rays by exposing animals in aerostats to heights of 25-35 kilometers, where the intensity of cosmic radiation is sufficiently great, did not produce specific results. Although the animals survived exposure to radiation of primary cosmic rays for 24 hours without apparent fundamental impairment of their health, an increase in the number of gray hairs was noted in them. Microscopic examination of the skin revealed that a few cells were damaged. The danger exists that heavy particles may effect the nerve centers.

Flights of experimental animals at high altitudes in research rockets gave physiologists a chance to make observations that could not be made under laboratory conditions. One of these was the reactions of animals when they were in a state of weightlessness. Following the propulsion of an artificial earth satellite into outer space weightlessness persists during the entire period of flight.

Animals in a weightless state suffer loss of coordination. Water turtles in an aquarium were unable to take food that floated alongside them when they were in a state of weightlessness; white mice assumed unusual postures. It is not yet known how a prolonged state of weightlessness will impair the health of animals and humans. If it becomes definitely established that weightlessness has an adverse effect on health of animals, then it will be necessary to put into practice Tsiolkovskiy's idea that an "artificial gravitational pull" be created by using a centrifugal force generated by the rocket motor.

A method of telemetric recording of cardiac activity and respiration has been developed. The electric potentials that appear with each heart contraction can be recorded with the aid of an electrocardiograph. The biopotentials of the heart are intensified with the aid of low frequency amplifiers and are modulated. Signals are then transmitted down to earth by means of a powerful radio transmitter. Here they are received and again transposed. (The main scheme of transmission of an electrocardiogram during rocket flights or from an artificial earth satellite is shown in Figure 2.)

By careful development of telemetering methods it will eventually be possible to receive signals recording the heart activity and respiration of animals during flights into outer space.

Earth-circling artificial satellites will not return to earth. They will gradually fall and by coming in contact with earth's dense atmosphere will burn out. Soviet scientists have done considerable research to solve the problem of saving animals sent up in satellites. Experimental animals were sent up in research rockets to heights of 100 kilometers and higher. After falling to 80 or 90 kilometers they were catapulted out of the rocket and subsequently parachuted in their sealed compartment. In some cases the animals, wearing protective helmets, were themselves catapulted and parachuted slowly to earth. No symptoms of illness were apparent in any of the animals so parachuted. Some of these animals made second flights into outer space. There is a basis, therefore, for thinking that the problem of safely abandoning an artificial satellite has been successfully solved.

Creation of an artificial earth satellite capable of returning to earth will provide for the safe landing of animals. Solution of the problem of re-entry will, therefore, considerably enrich our knowledge concerning the effects of interplanetary flights on the living organism.

The problem of safeguarding the life of animals for a period of many months in an artificial earth satellite cannot be resolved in a short period of time. For that reason, any information that can be obtained concerning the general condition of animals, even during the first few days of flight in the artificial satellite, will be a significant achievement. Such research will open up real possibilities for interplanetary travel.

124. A Pavlov Institute Professor in Budapest Discusses the Space Dog

"About the Therapy of Gastric Ulcers and Hypertension; and About Laika," by Denes Baracs, Budapest, Esti Hirlap, 4 Dec 57, p 3

An article in a Budapest daily paper discusses the visit to Budapest of Prof Ayrapet'yants [probably E. Sh. Ayrapet'yants] of the Institute of Physiology imeni I. P. Pavlov, Academy of Sciences in Leningrad. The article touches upon the application of the conditioned reflex procedure in the treatment of stomach ulcers, high blood pressure, etc. and on the magnitude of research at the institute, which has 20 biological laboratories, a nerve clinic, an internal medicine clinic, and a mental hospital.

Prof Ayrapet'yants was asked specifically about data which was obtained from the space dog, "Laika." He answered: "Sorry, we cannot speak of that because the data is still being processed. But I might say that firing the dog into space was not only a great technical achievement, it was a great achievement of medical science as well, a triumph of cooperation between the two. The system which made possible the precise observation of the dog's life processes was the result of lengthy biological researches. Several expeditions from our institutes went to Elborus, the highest peak in the Caucasus, in order to study the behavior of organisms at great altitudes. These [studies] and later the rocket experiments, to an altitude of 200 kilometers, made Laika's trip possible...."

125. Chinese Research on Positive Pressure Breathing

"Influence of Positive Pressure Breathing on Some Interoceptive Reflexes," by Shen Chi-ch'un (沈 震 春), Sung Hsiao-lu (孙 小 鲁), and Li Shih-Yuan (李 士 媛), in Shanghai; Shen-li Hsueh-pao (Acta Physiologica Sinica), Vol 21, No 3, Sep 1957, pp 257-264

This article, published with an English abstract, presents a detailed report on the techniques and results of controlled experiments undertaken to observe the effects of pressure breathing on certain interoceptive reflexes and to explore the principal factors responsible for those effects.

The authors say that to the best of their knowledge there is no literature on the subject of their paper, although many people have reported on the influence of pressure breathing on the circulatory and respiratory system. In reviewing the significance of this study, they observe that scholars since 1878 have been concerned with the undesirable

side effects induced by positive pressure breathing when used in clinical medicine and surgery, and more recently when applied in aviation medicine to raise the aviator's endurance in the upper atmosphere, to make possible higher flight, and to meet emergency explosions in the absence of oxygen.

To 29 dogs slightly anesthetized with Pentothal Sodium and each weighing 6.2-18.7 kilograms, about 20 millimeters of pressure, as measured by the mercurial manometer, was applied during the breathing of air or oxygen. Oscillograms showing changes in the following areas during pressure breathing are reproduced and discussed: arterial blood pressure, peripheral vascular resistance, and respiration and heart rates; response to stimulation of chemoreceptors in the carotid and aortic bodies and in isolated perfused legs; response to stimulation of the pressor receptors in the carotid sinus; and response to electric stimulation of the central ends of the ischiadicus and vagus nerves and the peripheral end of the greater splanchnic nerve.

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A summary of the authors' observations is given in English as follows:

"Application of positive pressure breathing with either air or oxygen to the trachea of dogs anesthetized with Pentothal Sodium induces a decrease in respiration and cardiac rate, a lowering of peripheral resistance, and an abrupt fall in arterial blood pressure. Usually there appear marked respiratory waves in the arterial blood pressure. The magnitude of these respiratory and circulatory changes depends largely on the amount of positive pressure applied.

"During positive pressure breathing, the chemoreceptive reflexes from the carotid and aortic bodies and from isolated perfused legs as well as the pressor and depressor reflexes of carotid sinus origin are either decreased or abolished; the pressor response induced by electric stimulation of the central end of the vagus nerve is also considerably reduced."

Three factors which the authors consider responsible for the marked decrease of interoceptive reflexes during positive pressure breathing are analyzed and the mechanisms of their influence discussed. The three factors include (1) decreased interoceptive sensitivity brought about by increased oxygen in the blood, (2) central inhibition elicited as a reflex action on full expansion of the lungs and stimulation of large numbers of pulmonary pressor receptors, and (3) interruption of venous return by expansion of the lungs.

[For additional information on space medicine, see Item No 7.]

Veterinary Medicine

126. Death of Yugoslav Veterinarian

"Prof Dr Tihomir Savic Dies" (unsigned article), Zagreb, Borba, 16 Nov 57, p 4

Dr Tihomir Savic, professor at the Veterinary Faculty of the University of Belgrade, died 14 November 1957. Savic was born 22 February 1888 in Bosanska Gradiska. He attended secondary school in Sarajevo and the Veterinary Faculty in Vienna. In 1926, he was appointed associate professor at the Veterinary Faculty in Zagreb; in 1948 he was appointed full professor at the Veterinary Faculty of the University of Belgrade, where he was dean for a number of years. Savic was also administrator of the Institute for the Hygiene and Technology of Vital Foods in Belgrade and president of the Federal Commission for Vital Foods.

127. Historical Sketch of the All-Union Institute of Experimental Veterinary Medicine

"The All-Union Institute of Experimental Veterinary Medicine," by Prof Ya. R. Kovalenko and Prof F. A. Terent'yev, Moscow, Vestnik Sel'skokhozyaystvennoy Nauki, No 8, Aug 57, pp 51-58

A short historical sketch of the establishment and organization of the All-Union Institute of Experimental Veterinary Medicine is given. The institute was founded on the basis of the Veterinary-Bacteriological Laboratory in St Petersburg, which was organized in 1898. By 1917 the Veterinary-Bacteriological Laboratory had been reorganized into the State Institute of Experimental Veterinary Medicine. In 1918 the institute was transferred to Kuzminki near Moscow and in 1930 its name was changed to the All-Union Institute of Experimental Medicine.

The institute consists of the following 15 divisions (otdel): General Microbiology (Obshchaya Mikrobiologiya), Protozoology (Protozoologiya), Helminthology (Gel'mintologiya), Pathological Anatomy (Patologicheskaya Anatomiya), Physiology (Fiziologiya), Biochemistry (Biokhimiya), Pharmacology (Farmakologiya), Zootechnics (Zootekhnika), Veterinary Sanitation (Veterinarnaya Sanitatsiya), of the Study of Anthrax (po Izucheniyu Sibirskoy Yazvy), Tuberculosis (Tuberkulez), Glanders (Sapa), Rinderpest (Chuma Rogatogo Skota), Diseases of Swine (Bolezni Sviney), and Disease of Fowl (Bolezni Ptits). The institute also has a Laboratory of the Physiology of Agricultural Animals (Laboratoriya Fiziologii Sel'skokhozyaystvennykh Zhivotnykh) and the Laboratory for Preparing Mallein (Laboratoriya po Izgotovleniyu Malleina), and a series of clinics.

The institute has conducted research on brucellosis since 1930. Those currently involved in brucellosis vaccine research are M. K. Yuskovets, Ye. S. Orlov, and O. I. Moryakova.

The institute is regarded as one of the largest scientific institutions in the USSR. It has conducted considerable successful research on anthrax, glanders, listerellosis, rinderpest, and diseases of fowl. The institute is currently working on problems of stock breeding and on new methods for the manufacture of diagnostic, prophylactic, therapeutic, and other preparations. The institute also trains scientific personnel and offers courses for the advanced training of veterinarians.

128. Hungarian Drive Against Fowl Cholera

"Sale of Poultry Regulated" (unsigned article), Budapest, Nepakarat, 22 Nov 57, p 8

A decree restricting the sale of poultry has appeared in the Hungarian official gazette, Magyar Kozlony, No 123. According to the decree, from 21 November 1957 through 31 March 1958, only live and dressed poultry bearing the official tattoo marking, which certifies that inoculation against fowl cholera has been administered, may be sold or otherwise disposed of in Budapest, Gyor, Varpalota, Tata, Gyula, Komlo, Pecs, Szatmar, Miskolc, Ozd, and Salgotarjan.

In other cities and towns uninoculated poultry may be brought to market up to 31 December 1957. However, such poultry may be sold only to state or cooperative commercial organizations.

[For additional information on veterinary medicine, See Item No 74.]

Miscellaneous

129. Pathogenic Aerosol Test Chamber Produced

CPYRGHT "An Apparatus for Studying Aerosols" (Unsigned Article),
Moscow, Meditsinskiy Rabotnik, 27 Dec 57, p 4

"I. I. Terskikh, V. I. Chervonskiy, and V. M. Bolotovskiy, associates of the Institute of Virology imeni D. I. Ivanovskiy, Academy of Medical Sciences USSR, in cooperation with I. V. Kashin, engineer of the Central Planning and Design Bureau, Minister of Health USSR, have designed an experimental IVK-1 apparatus for the study of aerosols of especially dangerous and other infections. It also permits testing of various filterable materials.

"The first test model of the apparatus was prepared at the Moscow experimental factory 'Tekhnolog.'

"The apparatus is contained in a stainless steel housing closed on all sides. The aerosol, obtained in the spray compartment of the working part of the chamber, is drawn through a filter in two hermetic compartments in which the experimental animals are placed. The air drawn out of the chamber is disinfected by electricity and disinfectant. There is an instrument board behind the housing.

"The new apparatus can be used for various purposes: studying infections caused by aerosols of different pathogens and determining agents which can impede entrance of pathogens into the organism.

"Judging by the model prepared by the 'Tekhnolog' factory, it is possible to manufacture the necessary quantity of similar apparatuses to meet the needs of various scientific research institutions."

IX. METALLURGY

Nonferrous Metals. Rare Metals

130. Improved "Cyclone" Smelting of Nonferrous Metals

"High-Intensity Smelting Method" (unsigned article),
Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 11,
Nov 57, p 77

The Laboratory for Stokers and Industrial Furnaces [Institute of Power Engineering, Kazakh SSR] has developed a new "cyclone" method of smelting copper, copper-nickel, copper zinc, and polymetallic fine ores and concentrates.

In May and June this method underwent industrial testing at the Balkhash Copper Smelting Plant. It was established that, with this method, the productivity of the furnace is increased to more than 30 times that of reverberatory smelting, more than 15 times that of smelting in the suspended state, and more than 10 times that of the most efficient modern shaft furnace. "Cyclone" smelting saves considerable amounts of fuel, decidedly improves working conditions, and is adaptable to complete automatization.

The experimental smelting produced a high output of matte-about 50 percent, as compared with the 28-50 percent generally obtained at the plant.

131. Amalgamation Method of Thallium Extraction

"Principal Achievements of Science in Soviet Kazakhstan," by
K. I. Satpayev, Alma-Ata, Vestnik Akademii Nauk Kazakhskoy SSR, No 11, Nov 57, pp 20-30

A new amalgamation method of thallium recovery which increases several times the extraction of metal from the raw material was developed and introduced at the Chimkent lead smelter.

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132. Rare Metals Concentration in Kazakhstan

"At the Institute of Metallurgy and Concentration" (unsigned article), Alma-Ata, Vestnik Akademii Nauk Kazakh SSR, No 11, Nov 57, p 81

The Institute of Metallurgy and Concentration is studying the application of vacuum to metallurgy. A scientific associate of the institute, V. S. Yesyutin, Candidate of Technical Sciences, has developed a method of vacuum distillation of volatile impurities from crude tin. At present experiments on a semi-industrial scale are being conducted at a pilot plant built by the institute with the help of engineers and technicians of the Novosibirsk Tin Plant.

The institute has completed research on the concentration of the molybdenum ores of the Dzhanet deposit, and the first satisfactory results have been obtained. The Concentration Laboratory, in conjunction with the All-Union Scientific Research Institute of Nonferrous Metals, is now conducting an extensive test at one of the Ust'-Kamenogorsk enterprises. A successful completion of this test will afford the possibility of working one of the largest deposits of rare metals in Kazakhstan.

133. Enrichment of Zirconium, Titanium, and Other Elements

"For a New Rise of Mass Invention in the Technology of the Enrichment of Useful Minerals," by V. A. Ivanov and Yu. G. Melik-Stepanov; Moscow, Tsvetnyye Metally, Vol 30, No 10, Oct 57, pp 31-35

The automatic appliance ESU (electric nugget captivator) for the selective separation of gold nuggets in connection with washing-out processes has been developed by engineers at Nigrizoloto [Scientific Research Institute for Gold] on the basis of a device designed at Dal'stroy. This appliance has been in use for some time at a number of gold fields of the Lenzoloto [Lena Gold] Trust and at other enterprises of the nonferrous metallurgy industry. Hundreds of kilograms of gold have already been separated with its aid.

The operation of the X-ray luminescence automatic device for the separation of diamonds, which has been developed by V. V. Finno and L. M. Krasov, is based on the action of the X-ray-induced luminescence of diamonds on a photoelectronic multiplier. Use of the process in question at diamond occurrences at Yakutiya and the Ural has demonstrated its reliability and effectiveness: the degree of separation of diamonds with its use amounts to 100% for all practical purposes.

A method for the selective flotation of titanium-zirconium concentrates which has been developed by S. A. Sysolyatin at Uralmekhanoobr [Ural Affiliate of the Scientific Research Institute for the Mechanical Processing of Minerals] is of great practical importance from the standpoint of industrial application. Sysolyatin's method is more efficient and more highly selective than that used in Australia. The principle of its operation is as follows:

The combined concentrate containing ilmenite, rutile, and zircon is separated magnetically for the purpose of eliminating the ilmenite. The nonmagnetic fraction is treated with soda or calcium hydroxide; this is followed by a treatment with oleic acid (at $pH = 8$) and with sodium fluorosilicate (at $pH = 6.8$). The sodium fluorosilicate, which is added to the pulp after the collector, functions as a selective depressor that facilitates the selective desorption of oleates from the surface of the zircon and suppresses the latter. As a result the foam phase constitutes a rutile (titanium) concentrate, while the zircon, which remains in the flotation chamber product, can be subjected to flotation in its turn and separated from the quartz with the aid of cationic reagents. Separate concentrates are thus obtained which contain more than 95% of the total titanium and more than 94% of the zirconium.

Sysolyatin's method opens up extensive possibilities of simplifying the equipment, lowering costs, and improving the quality of the zirconium concentrate, to which very rigid requirements are put by metallurgists (specifically, the content of titanium dioxide in it must not exceed 1%).

The use of the ion-exchange resin AN-18 in accordance with a suggestion made by I. N. Plaksin, M. S. Girdasov, and others makes it possible to extract gold from alkaline cyanide solutions obtained as a result of the cyanide treatment of ores. Application of ion-exchange resins will lead to the solution of the following problems in nonferrous metallurgy: complete replacement of zinc used for the precipitation of gold; extraction of gold from solutions containing very small quantities of gold, which were formerly regarded as waste; extraction of nickel, cobalt, and other metals from waste waters; extraction of platinum from waste waters of refining plants; and separation of niobium, tantalum, and titanium. The AN-18 resin has a retention capacity for metals which is tens of times higher than that of other known resins.

D. I. Nedogovorov and Ye. A. Savari developed a procedure for the enrichment of Ukrainian titanium-zirconium sands by flotation with the use of a cheaper collector instead of oleic acid. This method is superior to that of enrichment by gravity which has been commonly applied hitherto.

I. N. Plaksin, V. A. Glembotskiy, and others proposed the use of new silicon-organic flotation reagents.

134. Titanium-Vanadium-Niobium Alloys

"The Melting-Point Diagram of the System Titanium-Vanadium-Niobium," by I. I. Kornilov and V. S. Vlasov, Moscow, Zhurnal Neorganicheskoy Khimii, Vol 2, No 12, Dec 57, pp 2762-2765

The three-dimensional melting point diagram of the system Ti-V-Nb and the two-dimensional diagram representing the solidus of this system have been constructed. The design of the special furnace which was used for the determination of melting points is described.

[SIR Note: Alloys of niobium ought to prove of value as structural material for nuclear reactors if the relatively low thermal neutron absorption cross section of this metal is largely retained by alloying it with metals which have an intermediate cross section (e.g., V and Ti) and the composition and properties of the alloys are such that the principal drawback of niobium, namely, its low oxidation stability, will be eliminated (cf. S. Glasstone, Principles of Nuclear Reactor Engineering, Van Nostrand, New York, 1955, pp 504-505).]

135. Rare-Metal Resources of the USSR

"The Mineral Raw Material Basis of the USSR Nonferrous Metallurgy Toward the 40th Anniversary of the Great October Socialist Revolution," by P. Ya. Antropov, Tsvetnyye Metally, Vol 30, No 10, Oct 57, pp 9-14

The Northwest of the USSR is particularly rich in rare-earth elements. In this section of the country there are deposits large enough to provide for the industrial production of all rare-earth elements.

On the basis of geological surveys which have been conducted, one may conclude that the USSR occupies a leading position in the world as far as supplies of copper, lead, and zinc are concerned and one of the foremost places with regard to supplies of tungsten, nickel, cobalt, and antimony.

The manifold nature of the nonferrous ore deposits of Kazakhstan considerably increases the value of the ores and makes it possible to produce by-product germanium, thallium, scandium, zirconium, tellurium, selenium, indium, and other rare and dispersed elements in addition to the principal elements contained in the ores.

[SIR Note: Zirconium and rare-earth element deposits are of importance from the standpoint of the development of nuclear energy technology, while germanium, selenium, and tellurium are of value as semiconductor materials.]

Fabrication

136. Submerged-Arc Welding of Titanium

"Some Peculiarities of Titanium Welding Under Flux,"
by S. M. Gurevich, Kiev, Avtomaticheskaya Svarka,
No 5, Sep/Oct 57, pp 38-48

The article describes experiments conducted at the Order of the Labor Red Banner Institute of Welding imeni Academician Ye. O. Paton, Academy of Sciences Ukrainian SSR.

It was found that, during the interaction of the flux-slag with the metal, certain exchange reactions take place between the titanium, together with its oxides, and the components of the oxygen-free flux. Experiments were conducted with fluoride and chloride fluxes (CaF_2 , BaCl_2 , NaF), and it was found that a flux composed of a mixture of fluorides and chlorides is best suited for the welding of titanium. To further improve the welding technique, the institute developed a titanium welding-wire (2 mm) holder and a flux padding.

Miscellaneous

137. Soviet Academician Discusses Metallurgy of the Future

"Metallurgy of the Future," by Academician I. Bardin,
Moscow, Promyshlenno-Ekonomicheskaya Gazeta, 19 Jan 58

CPYRGH

"We cannot say that the currently accepted technological method of producing the most common metal in modern technology, iron, is the best possible. The general course of this process is as follows: After being processed at the concentration plant, the ore is placed in the blast furnace where it is mixed with coke and heated. The iron is reduced by deoxidation and is saturated with carbon. Pig iron is obtained; it is melted in open-hearth furnaces, and the carbon is burned out of it. Steel ingots are obtained, which are rolled with several heatings.

CPYRGHT

"Why not exclude from this series of technological operations the intermediate laborious processes? Why not change this now discontinuous process into a continuous one? The production of finished iron or steel, with the required composition and in the form of the desired finished product (rails, channels, I-beams), is the age-old dream of the metallurgist."

"It is certain that metallurgy of the future will discard the technology accepted at present. Modern complex techniques, which involve the blast furnace, open hearth, Bessemer converter, and blooming and slabbing mills, will become unnecessary.

"Naturally, that does not mean that in the next few years we shall begin to tear down our blast furnaces and replace them with some new installation for the direct production of finished iron. The blast-furnace process has been with us for a long time and will continue to be improved. In the next few years both the construction and automation of blast furnaces will be continued.

"Nevertheless, fundamental changes are already being planned in metallurgy. An installation in which a direct reduction of metal will take place can be visualized as a large rotating tube. At one end a well-refined powdered ore will be added (the metal oxide without any foreign admixtures) and at the other end the reducing gas, for example, hydrogen. The pure metal obtained, in the form of finely divided powder, then is remelted or is pressed into the desired objects.

"I should like to consider another question -- a new method of processing steel to increase its mechanical properties. The classical processing method has been the application of heat -- hardening, annealing, tempering, chemicothermal cementation, etc. Experience shows that a new principle will soon be applied to metal treatment -- the bombardment of the metal with a stream of neutrons. By such a method, steel with a completely new and surprising quality is produced. The development of methods and the creation of apparatus for a new form of metal treatment is a problem of the very near future. The introduction of atomic techniques into metallurgy opens up new vistas.

"For the first time man will be able to construct with the aid of radioactivity an alloyed steel of desired composition without introducing any rare, expensive alloying elements, but by creating them directly in the ladle, in the molten steel, out of atoms of iron, carbon, perhaps sulfur, phosphorus, or other abundant elements added to the melt.

CPYRGHT

"A ladle containing steel will only have to be held under a radiation source for several tens of seconds for the complex nuclear transformation to be initiated inside the molten steel. After several days have passed, new chemical elements appear in the solidified, cooled steel as a result of the effect of the residual radioactivity, i.e., a 'ripening' of the metal takes place.

"It is probable that, by altering the structure of the atomic nucleus, it will be possible to obtain rare and dispersed elements. An entirely new branch of industry -- radiation metallurgy -- will emerge, for which the transformation of lead into gold, the production of rare chemical elements out of more abundant ones, will be just as common as the production of metal from ore is today."

138. Member of the Bucharest Technical University Faculty in Hungary

"Czechoslovak, Polish, Rumanian Scientists and Ministerial Leaders Arrived in Hungary," (unsigned article), Budapest, Nepszabadsag, 12 Nov 57, p 5

Florea Oprea, a lecturer in the Metallurgical Department of the Technical University in Bucharest [probably the Bucharest Polytechnical Institute], is in Hungary.

X. PHYSICS

Nuclear Physics

139. High-Resolution Isotope Separator Described

"Electromagnetic Installation With High Resolution for Separation of Isotopes of Heavy Elements," by L. A. Artsimovich, G. Ya. Shchepkin, V. V. Zhukov, B. N. Makov, S. P. Maksimov, A. F. Malov, A. A. Nikulichev, B. V. Panin, and B. G. Brezhnev, Atomnaya Energiya, Vol 3, No 12, Dec 57, pp 483-491

An electromagnetic installation for the separation of isotopes with a relative difference in mass of $1/240$ is described. The following requirements were set up in describing the separator: high resolution and dispersion, stable electric and magnetic fields, easily convertible for the separation of quantities ranging from tenths of grams to milligrams, and capable of handling, if necessary, highly toxic and alpha-active elements.

The equation for the axially symmetrical focusing field and a graph of the theoretical and actual radial distribution of the field strength are given. A dispersion of 20 mm per 1% $\Delta m/m$ and a focusing angle of 225° were taken as the initial values for determining the parameters of the focusing system. The null trajectory of the ions was calculated to be 1300 mm. The electromagnet weighs 30 tons, of which 4.3 tons is copper, and has a low-voltage winding with a supply power of about 7 kw. A diagram of the electromagnet is given.

The power supply keeps magnetic field oscillations within 0.005% and accelerating-voltage oscillations within 0.01%. A special stabilizing system was developed in which an oscillographic electron-beam tube was used as a transmitter. The tube is placed in the scattering field of the electromagnet and compensated by a field with inverse sign to that of the permanent magnets.

The vacuum system has a capacity of 3000 liters/sec at 10^{-4} - 10^{-5} mm Hg. Pressures of 4 - $6 \cdot 10^{-6}$ mm Hg are obtained from the system. A series of locks is used to protect the vacuum while sources and receivers are being replaced.

The ion source is of the arc-discharge type. Dispersion amounts to 8.5 mm for $\Delta m/m = 1/240$.

Experiments to determine the concentration of samples of lead, uranium, and plutonium are described. Concentration tables and mass spectra are given.

140. Institute of Electrophysical Apparatus to Build 50 Bev Accelerator

"The Founders of the New Soviet Accelerator" (unsigned article), Moscow, Izvestiya, 27 Dec 57, p 1

Workers of the Institute of Electrophysical Apparatus (Institut Elektrofizicheskikh Apparatur, Ye. Komar, Doctor of Technical Sciences, director, have taken part in the planning and development of the world's largest synochrophasotron. Currently, workers of the institute are constructing a gigantic accelerator with a maximum energy of 50 Bev.

141. Personnel of Joint Institute of Nuclear Research

"In the Joint Institute of Nuclear Research," by R. M. Lebedev, Moscow, Atomnaya Energiya, No 9, Sep 57, pp 263-265

The following personnel and organizational subdivisions of the Joint Institute of Nuclear Research are given in an article concerning a conference held by the institute in Dubna on 15-18 May 1957:

Prof D. I. Blokhintsev, director of the institute; Prof V. I. Veksler, director of the Laboratory of High Energies (Laboratoriya Vysokikh Energiy); N I. Pavlov, Laboratory of High Energies; K. V. Chekhlov, Laboratory of High Energies; L. P. Zinov'yev, Laboratory of High Energies; I. V. Chuvilo, Candidate of Physicomathematical Sciences, head of a sector of the Laboratory of High Energies; K. D. Tolstov, head of a sector of the Laboratory of High Energies; Prof A. I. Shal'-nikov, head of a sector of the Laboratory of High Energies; M. I. Podgoretskiy, head of the Sector of Emulsion Chambers (Sektor Emul'sionnykh Kamer); Ye. N. Matveyev, Sector of Emulsion Chambers; M. N. Medvedev, Sector of Emulsion Chambers; V. P. Dzhelepov, Doctor of Physicomathematical Sciences, director of Laboratory of Nuclear Problems (Laboratoriya Yadernykh Problem); B. I. Zamolodchikov, chief engineer of the Laboratory of Nuclear Problems; M. G. Meshcheryakov, Laboratory of Nuclear Problems; G. R. Poze, Laboratory of Nuclear Problems; B. M. Pontekorvo, head of a sector of the Laboratory of Nuclear Problems; V. M. Sidorov, head of a sector of the Laboratory of Nuclear Problems; V. N. Mekhedov, head of a sector of the Laboratory of Nuclear Problems; Academician N. N. Bogolyubov, director of the Laboratory of Theoretical Physics (Laboratoriya Teoreticheskoy Fiziki); M. A. Markov, Laboratory of Theoretical Physics; V. Yu. Votrub, Laboratory of Theoretical Physics;

Prof I. M. Frank, director of the Laboratory of Neutron Physics (Laboratoriya Neytronnoy Fiziki); Prof M. Ya. Danysh, deputy director of the institute; Ya. A. Smorodinskiy, unidentified laboratory; and Ya. Zhevusskiy, unidentified laboratory.

142. Atomic and Hydrogen Bombs: Construction Principles, Radioactivity, and Determination of Time and Type of Detonation

"On the Thermonuclear Weapon," by Prof M. Neyman, Voyennyy Vestnik, No 9, Sep 57, pp 67-72

Three types of atomic and hydrogen bomb are described: single-phase (atomic), two-phase (hydrogen), and three-phase (thermonuclear with uranium jacket). The principles involved in the reaction are presented.

Radioactive contamination resulting from the US test at Bikini in 1954, the cobalt bomb, zinc bomb, and air sampler used in aircraft, and methods for determining the time and type of nuclear weapon explosion are also discussed.

143. Polish Cooperation in Development of Nuclear Research

"Eminent Representatives of World Atomic Energy: On Prospects and Cooperation of Poland on the Development of Nuclear Energy," by L. K. Warsaw, Przeglad Techniczny, 12 Aug 57, pp 579-581

The information below is taken from an article in a Polish technical biweekly periodical, reporting on the press conferences of Professors Blokhintsev of the USSR and Perrin of France after their recent visits to Polish research centers.

Interview with Blokhintsev

An expression of Poland's interest in the production of nuclear energy was the 1956 creation of the Institute of Nuclear Research (IBJ). Poland has also joined the Joint Institute for Nuclear Research (ZIBJ) in Dubna, near Moscow.

The purpose of Blokhintsev's visit to Poland, at the request of Minister Billig, Plenipotentiary of the Government for Matters of Nuclear Energy, was to discuss further cooperation in nuclear energy between the Soviet Union and Poland. Both men believe the developmental prospects are very good.

Some results of cooperation are the training of Polish specialists in Soviet centers and the building of the first atomic reactor in Poland and other research installations on the basis of Soviet documents. The Soviet Union supplies radioactive isotopes, which are finding increasingly more extensive use in Poland.

The problem of the form and division of cooperation was discussed in May 1957 at the ZIBJ. It was decided that besides the Polish scientists working in Dubna, part of the scientific problems will be worked out in the IBJ in Poland. Very soon, work is expected on special coordination of works in radiochemistry, neutron physics, and nuclear reactions. There are also possibilities that Soviet scientists may visit Poland to consult with Polish specialists.

Professor Blokhintsev visited the IBJ in Swierk, Warsaw, and Krakow and believes Poland is creating good conditions for developing nuclear physics.

Polish students will be able to conduct work on high-energy particles and nuclear reactions and research in nuclear physics, radiochemistry, and the use of radioactive isotopes. Blokhintsev expressed high regard for the scientific level of Polish specialists.

Poland's financial share of the costs of conducting work in the ZIBJ has been set at 6.75 percent of the costs; the Soviet Union will cover 48.5 percent. These costs do not include building and equipping the Soviet center. In the Soviet Union, work is being done on elementary particles of the atomic nucleus. Work on thermonuclear energy (the basis for hydrogen weapons) is not carried on at Dubna.

Professor Blokhintsev pointed out that the level of radioactivity released in atom and hydrogen bomb test was only part of the so-called permissible dosage of radiation. He agrees with the English physicist John Cockroft that the radioactivity is only 1/100 of the permissible level.

Interview with Perrin

The High Commissioner of France on Matters of Atomic Energy, the eminent physicist Professor Francis Perrin and Dr M. B. Goldschmidt, director of the departments of Chemistry and Foreign Affairs of the Commissariat, visited Poland at the beginning of June 1957 and stayed about 10 days. They visited the Polish nuclear research centers in Krakow and Warsaw, the laboratories of the Institute of Physics at Warsaw University and Jagiellonian University, and the main nuclear research center in Swierk near Warsaw. They were very favorably impressed with these centers and the expert cadres.

Several discussions were held concerning cooperation between France and Poland on nuclear energy research and its technical adaptation to peaceful uses. Progress reports of both countries were submitted and discussed.

The visitors acknowledged the special importance in the universal use of nuclear energy and the training of scientific workers as well as technical cadres. Proper preparation is a very difficult task in building atomic industry and development of nuclear power.

Professor Perrin acknowledged as completely possible and real the intensive cooperation between France and Poland. As an example of cooperation, two Polish scientists are now in France in a 6-week course on use of radioactive isotopes. There are possibilities for further exchange of scientists for short-term specialization courses. After the center in Swierk is activated, France will send scientists and workers there for joint research and experiments.

144. Atomic Progress in Yugoslavia

"Important Achievements of Our Atom Specialists," by Z. Gagic, Zagreb, Vjesnik, 9 Dec 57, p 2

Dr Ivan Supek, professor of the University of Zagreb and president of the Scientific Council of the "Rudjer Boskovic" Nuclear Institute (Naučni savjet nuklearnog instituta "Rudjer Boskovic") in Zagreb, is one of Yugoslavia's outstanding nuclear physicists. In an interview, Supek said that the institute is working on some of the basic scientific problems in the creation of the so-called atomic industry. Studies in the field of transistors have been begun, and research in metals and semiconductors is carried on with close cooperation among chemists, physicists, electronics specialists, and theoretical physicists. Radioactivity is studied for its effect on organisms and to develop means of protection against it.

Supek also pointed out that one of the largest European cyclotrons is being built by the institute and will be completed in 1958. It was designed by Yugoslav specialists and is being constructed by several Yugoslav factories, such as the "Rade Koncar" Enterprise, which is providing the cooling system for the magnets; the "Radioindustrija" Enterprise, which is supplying the oscillating system for accelerating the electrically charged particles; and the "Ventilator" Factory, which is providing the air conditioning. Besides advancing studies of the atom's nucleus, the cyclotron will be a source of radioactive isotopes. Counters for use in the practical applications of isotopes have been developed and will be manufactured by the "Vlado Bagat" Factory in Zadar.

One of the tasks which will devolve on the nuclear institutes will be the working out of the scientific bases for applying nuclear reactors to ship propulsion, said Supek. Basic nuclear material is available in Yugoslavia, but chemists face the problem of developing technological methods for its most economic exploitation.

Zarko Cizmic, consultant to the Federal Chamber of Industry, said in an interview that the introduction into industry of various instruments using isotopes is being encouraged. Such instruments would be used for measuring the thickness of material and level of material in sealed containers or for countering electrostatic electricity in the textile industry, besides other uses. The application of radioactive isotopes to pasteurization of food is also under consideration. Industry is also studying the problem of producing materials which would have special application in nuclear technology, such as special steels and alloys.

Engr Salom Suica, head of the Federal Commission for Nuclear Energy (Savezna komisija za nuklearnu energiju), pointed out that one of the largest projects to be achieved in 1957 is the construction and operation of a large atomic reactor in the Nuclear Institute in Vinca. Its capacity will be 7-10 megawatts, and it will permit production of isotopes for industrial, agricultural, and medical uses.

Radiophysics

145. Contradictions in the Definition of the "Roentgen"

"On the Problem of Determining the Roentgen in the 'Recommendations of the International Commission on Radiological Units, 1953,'" by S. N. Ardashnikov and N. S. Chetverikov, Atomnaya Energiya, Vol 3, No 9, Sep 57, pp 238-244

Contradictions encountered in definitions of the "roentgen," a unit of X- and gamma-radiation, are analyzed. The widespread definition of the roentgen as a unit of physical dose (All-Union Standard 7623) differs from the recommendations of international congresses (Stockholm, 1928; Chicago, 1937), where the roentgen is considered to be a unit of dose but not physical dose. This has caused much confusion in the understanding of the physical aspects of phenomena where the roentgen is used as a unit of measurement. An unsuccessful attempt was made to resolve essential contradictions in the definition of the roentgen in the Recommendations of the International Commission on Radiological Units, 1953." The fundamental shortcoming in the definition of the roentgen, that it is measured by "the amount of X- or gamma-radiation," is maintained. The definition

in the above "Recommendations" of the amount of radiation as the integral of the intensity with respect to time leads to an understanding of the amount of radiation as the density of the flux at a point, i. e., a third variant of the concept of dose is introduced, which creates even further confusion.

The article gives the requirements which should be met in the definition of the fundamental unit of measurement of ionizing radiations, the roentgen and its equivalents.

146. A Training Roentgenometer for Military Personnel

"A Training Roentgenometer With Gas Counter," by Maj N. Vaynshteyn and Engineer-Maj B. Bukhin, Voyenny Vestnik, No 8, Aug 57, pp 63-64

A modified roentgenometer for military training purposes is described. The proposed training roentgenometer consists of the usual military roentgenometer with a few minor alterations. The gas counter CTC-5 is connected in place of the ionization chamber at the direct-current amplifier input. This makes the sensitivity of the roentgenometer 40,000 times as great and permits detection of gamma radiation from a source with an activity of 0.4-0.6 curie at distances greater than 400 meters. The scale of the training roentgenometer remains unaltered. Thus, a monitor can remain in an area with an indicated dose intensity of "400" roentgens per hour without exceeding the maximum permissible dose.

147. Device for Dosing Radiant Energy Described

CPYRGHT "An Integrating Device for Dosing Radiant Energy," by K. V. Chmutov, V. A. Prokhorov, and N. G. Alekseyev, Academy of Sciences USSR, Institute of Physical Chemistry, Moscow, Zhurnal Fizicheskoy Khimii, Vol 31, No 8, Aug 57, pp 1896-1899

"A simple and compact device for dosing radiant energy (visible light, infrared, X rays) is described. Current passing through a photoresistance under the action of light charges a condenser. When the voltage reaches the ignition potential of a voltage stabilizer, the condenser discharges and the discharging current through a relay turns on the radiation source. The sensitivity of the device is regulated with the aid of a potentiometer and by varying the capacity of the condenser. The device may be used for dosing radiation over long-time periods." --English abstract

CPYRGHT

Mechanics

148. Nonsteady Laminar Boundary Layer in an Incompressible Fluid

"Approximate Method of Integration of Equations of Nonsteady Laminar Boundary Layer in an Incompressible Fluid," L. A. Rozin; Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 615-623

The usual method of successive approximations for the solution of equations of a nonsteady laminar boundary layer is considered too cumbersome. Simplified methods for the solution of these problems were suggested by Ye. M. Dobryshman (PMM, Vol 20, No 3, 1956) by using the conception of a "layer of finite thickness" and some suggestions by M. Ye. Shvets (PMM, Vol 13, No 3, 1949).

An approximate approach to the problem of nonsteady laminar boundary layer in an incompressible fluid is suggested by using equations of pulses and a certain one parameter family of velocity profiles. Such a method, as known from the work by E. J. Watson (Proc. R. Soc., 231A, No 1184, p 106, 1955), yields very good results in the analysis of stationary problems.

149. Flutter of Shells and Panels in a Gas Flow

"Flutter of Cylindrical Shells and Panels Moving in a Gas Flow," by R. D. Stepanov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57 pp 644-657

The equations for the shells are analyzed within the framework of the general technical theory of inclined shells and of shells of medium length presented by V. Z. Vlasov (Obshchaya Teoriya Obolochek [General Theory of Shells], 1949). The aerodynamic forces acting on the shell are computed as forces of excess pressure by using a formula suggested by A. A. Il'yushin (Trudy DAN, Vol 2, 1949). The values of critical velocities of the flow for closed cylindrical shells are computed by the variation method and tabulated.

150. Stress Strain Theory

"Theorem of Reciprocal Action and the Construction of Green's Tensor in the Theory of Small Elastic-Plastic Deformations," by N. A. Kilchevskiy, Kiev; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 634-643

A generalization of the theorem of reciprocity of action is attempted for the case of an elastic-plastic medium, as well as for two bodies, which before deformation are identical in geometric shape and dimensions, but which differ in the elastic-plastic properties of their matter. The state of stress of the elastic-plastic matter corresponds to an ordinary load.

After having generalized the theorem of reciprocal action to the case of small elastic-plastic deformations, Somilian's method is extended to the problems of a static or an elastic-plastic medium in the case of an ordinary load, by applying an expansion in powers of a certain small parameter. The algorithm of an approximate construction of Green's tensor is indicated for an unlimited elastic-plastic body. This method of solution of elastic-plastic problems is related to the method of "elastic solutions" presented by A. A. Il'yushin (Plastichnost [Plasticity], 1948).

151. A Case of Stationary Thermal Convection

"Solution of Equations for a Certain Case of Stationary Thermal Convection in an Infinite Inclined Circular Cylinder," by Ye. Kh. Drakhlin, Perm; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57 pp 693-695

An accurate solution for temperature and velocity is found for the problem of stationary thermal convection in the middle part of a long inclined cylinder contained in an infinite solid/mass with a temperature gradient constant at infinity in space and time. The assumption is made that the lines of current are parallel to the axis of the cylinder and that a temperature gradient along the cylinder axis is absent.

152. Stability of an Unevenly Heated Fluid

"Stability of an Unevenly Heated Fluid in a Spherical Cavity," by Ye. M. Zhukhovitskiy, Perm; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 689-693

The problem of stability of an unevenly heated fluid filling a spherical cavity in a solid body heated from below is analyzed. An approximate solution of the problem is given by using the method of B. G. Galerkin.

153. Optimum Regulation Problem Treated

"A Problem of Optimum Regulation," by N. N. Krasovskiy, Sverdlovsk; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 670-677

An attempt is made to solve a problem in finite-differences equations and to find the limiting transition to the corresponding problem in differential equations if the finite difference $h \rightarrow 0$. The construction of the basic part of the system of equations is supposed to be specified, and only the governing values in the equations may be varied. The problem of choosing the optimum parameters in the case of differential equations was solved by N. G. Chetayev (PMM, Vol 15, No 3, 1951). The optimum trajectories for $h=1/2$ and $h=1/4$ are plotted.

154. "Floated" Gyroscope

"Motion of a symmetrical Gyroscope Whose Cavity Is Partially Filled With Fluid", by G. S. Narimanov, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 696-700

Equations of small perturbations of stationary rotation of a symmetrical gyroscope are derived. The cylindrical cavity of the gyroscope is partially filled with a fluid. During stationary rotation, the gyroscope and the fluid in the cavity rotate as a solid around the axis of symmetry-- in this case, vertical. The difference between perturbed motion and stationary rotation of the gyroscope and fluid is considered to be small, making possible linearization of equations with regard to variations of perturbed motion parameters. The obtained equations may be used for investigation of stationary rotation and for the evaluating how the rotation is affected by various parameters of the system.

155. Heat Exchange of a System of Bodies

"A Certain Problem of Heat Exchange of a System of Bodies", by Ye. M. Kim, Kharkov; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 624-633

An attempt is made to solve the problem of heat exchange of a system of bodies in a state of thermal contact. The thermal flow is supposed to vary in a continuous way in vicinity of the boundaries of the contacting bodies.

The multidimensional problem of heat exchange of the system has not yet been accurately solved, the author notes. Analysis is made for a plane problem when the contact contour is a straight line. The solution of this problem is considered important; other cases are being considered as a generalization of this case.

156. Small Perturbations Method Applied to Laminar Boundary Layer Problem

"Application of the Method of Small Perturbations to Problems of a Laminar Boundary Layer," by V. V. Lunev, Moscow; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep/Oct 57, pp 606-614.

Equations of a laminar boundary layer of a compressible gas with small pressure gradients are solved with an arbitrary ratio of viscosity to temperature and with a variable Prandtl number. The dissociation of the air does not affect the method of solution. The results are applicable to a supersonic laminar boundary layer on thin bodies, and on bodies differing little from a wedge, a cone, etc.

157. Boundary Conditions in Supersonic Motion in Slightly Rarefied Gases

"Equations of Boundary Layers and the Respective Boundary Conditions in the Case of Motion at Supersonic Speed in Slightly Rarefied Gases," by Yu. P. Lunkin, Leningrad; Moscow, Prikladnaya Matematika i Mekhanika, Vol 21, No 5, Sep-Oct 57, pp 597-606

In the case of motion at supersonic speed at high altitudes the length of free run of molecules ℓ will be of the order of the moving body L . The gas in which the length ℓ is small, but comparable with L , will be called slightly rarefied gas.

The equations of the boundary layer in the slightly rarefied gas are derived according to the Prandtl theory, but differing from the usual Prandtl equations by some supplementary terms, containing higher derivatives of velocity and temperature. In the derived equations the normal pressure gradient differs from zero and it is expressed by the supplementary terms. The boundary conditions of these equations are found by means of the kinetic theory. They are a generalization of Maxwell's and Smoluchowski's conditions for the case of supersonic flow. The limits of application of these equations in velocity and temperature are indicated.

158. Correction to the Hydrodynamic Theory of Heat Transfer

"Experimental Determination of a Correction to the Hydrodynamic Theory of Heat Transfer During Turbulent Movement in Tubes," by L. A. Vvedenskaya, Sb. nauch. tr. Kuybyshevsk. industr. in-ta, 1956, No 6, Book 1, pp 225-227 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9068, by L.V. Kozlov)

The author works out a correction to Prandtl's equation of hydrodynamics:

$$N = \frac{cf}{8} R P \bar{K} \quad (1)$$

where N, R and P correspond to the numbers of Nusselt, Reynolds and Prandtl for the flow:

$$\bar{K} = \frac{1}{1 + w_2 (P_m - 1) / w} \quad (2)$$

using the experimentally obtained relationships:

$$N = 0.023 R^{0.8} P^{0.4} \quad (3)$$

$$c = \frac{0.3164}{R^{0.25}} \quad (4)$$

From equations (1), (3) and (4) it follows that

$$\bar{K} = 0.582 \frac{R^{0.05}}{P^{0.6}} \quad (5)$$

Using formula (2) and the expression (5) the author finds the relation

$$\frac{w_2}{w} = 1.72 R^{-0.05} \quad (6)$$

which is recommended for the calculation of w_2/w . Here w is the velocity of the fluid in the center of the boiler and w_2 is the velocity on the boundary of the laminar boundary layer.

159. Viscosity Coefficient of a Boundary Layer

"Laminar Flow Around a Lamina in the Nonlinear Theory of the Boundary layer of a Viscous Compressible Fluid for an Arbitrary Distribution of Temperature Along the Surface," by V. P. Shestopalov, Uch. zap. Khar'kovsk. gos. ped. in-ta, 1956, 18, pp 121-133 (from Referativnyy Zhurnal --- Mekhanika, No 8, Aug 57, Abstract No 9037, by E.I. Obroskova)

The author assumes that the coefficient of viscosity is nonlinear with respect to temperature. As a result of this, a supplementary member with a new coefficient of viscosity proportional to T^2 (T being temperature) appears in the equation of motion.

Further solution of the system of equations for boundary layer is performed by the Chapman and Rubesin method (Mekhanika, Sb. perev. i obz. in. period. lit., 1950, No 4) with the same assumptions.

It is shown that for large numbers of M the thermal boundary layer considerably increases in thickness in comparison with the layers calculated by Chapman and Rubesin. This is not substantiated by either graphs or tables.

160. Boundary Layer at a Surface of Large Curvature

"Boundary Layer at a Surface of Large Curvature in a Longitudinal Direction," by A.N. Rakhmanovich, Tr. Ufimsk. aviats. in-ta, 1956, No 2, pp 3-22 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9037, by N.N. Shirkov)

The order of magnitude of the transverse pressure gradient in a boundary layer, a method for investigating the thickness of the boundary layer, a method for determining relative thicknesses, and the accuracy of ordinary methods for determining the velocity profile in a boundary layer are treated in investigations of the boundary layer in curvilinear cansls.

Investigations were conducted on the surface gradients of profiles with a median line arc of 89° . Tests were performed under conditions corresponding to $M = 0.3$ and $R = 3.43 \times 10^2$. As a result of the investigations it was found that the transverse gradient in the boundary layer was of the same form as that in basic flow. In nonlinear flow over a large curvature, the velocity profile in the boundary layer must be determined according to the results from dynamic pressure changes. During flow over a convex surface the boundary layer contains regions with positive and negative transverse gradients of velocity, but over a concave surface the transverse gradient of velocity does not change sign.

The thickness of the boundary layer in a nonlinear flow over a large curvature can be determined by the distance δ from the surface of the body at which viscosity causes a decrease in the amount of motion of a unit mass by 0.01 of this value in a basic flow. Expressions are given for determination of the relative thicknesses in curvilinear flow from which certain expressions for linear flow can be obtained for a special case.

161. Strength of a Circular Rotating Disk

"Calculation of the Strength of a Circular Rotating Disk Weakened by an Eccentric Hole," by B.A. Obodovskiy, Sb. nauch. tr. Zhdanovsk. metallurg. in-ta, 1955, No 3, pp 293-299 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9294, by I.A. Prusov)

This work contains an examination of the stress condition in a thin uniform circular disk weakened by an eccentric hole. The disk rotates uniformly about an axis which goes through the center of the disk and is perpendicular to its surface.

D.I. Sherman's method for double-connected regions (Dokl. AN SSSR, 1940, 37, No 9, pp 911-913) is used in the solution. This method is based on an analytical continuation of the functions of a complex variable of Kolosov-Muskhelishvili through one of the boundaries of the region by means of an auxiliary function, for which an integral equation is given. An approximate solution is made by reducing the latter to an abbreviated system of linear algebraic equations.

162. Thin Spherical Shell Boundary Problem

"One Boundary Problem of a Thin Spherical Shell," by F.D. Sigua, Tr. Tbilissk. matem. in-ta, 1956, 22, pp 265-275 (from Referativnyy Zhurnal -- Mekhanika, No 8, Aug 57, Abstract No 9317, by E.I. Obolashvili)

This work contains calculations for the deformed condition of a spherical shell with boundary conditions

$$u_{\theta} = C, \quad u_{\varphi} = w = M_{\theta} = 0 \quad (\theta = \theta_0)$$

where u_{θ} , u_{φ} , w are the displacement components, M_{θ} is the bending moment, and C is the fixed constant.

The examined boundary problem is reduced to a system of nonhomogeneous algebraic equations in terms of unknown constants by means of I.N. Vekua's formula (Novyye metody resheniya ellipticheskikh uravneniy [A New Method for the Solution of Elliptical Equations], Moscow-Leningrad, Gostekhizdat, 1948). A solution of this system is given for a particular case of assigned outer forces. Stress components and displacements are similarly determined.

XI. MISCELLANEOUS

163. Antiatomic, Antichemical, and Antibacteriological Defense of the Soldier in Battle

"Protection of the Soldier From Methods of Mass Destruction," by Col M. Bannikov, Candidate of Military Sciences, and Col V. Sorokin, Candidate of Military Sciences, Voyenny Vestnik, No 8, Aug 57, pp 86-88

The article reviews the brochure Protivoatomnaya, Protivokhimicheskaya, Protivobakteriologicheskaya Zashchita Soldat v Boyu, (Antiatomic, Antichemical, and Antibacteriological Protection of Soldiers in Battle), by B. V. Kokosov, Voenizdat, 1957, 128 pp.

The purpose of the reviewed book is to provide Soviet soldiers and preconscription youth with essential information on protection from methods of mass destruction in battle. It covers the following topics: description of the destructive factors in the action of atomic, chemical, and bacteriological weapons; methods of individual and collective antichemical defense and rules for their use; methods for sanitary treatment of personnel, and decontamination of materiel and vehicles from radioactivity, chemicals, and bacteria; duties and operations of a soldier during radiation and chemical reconnaissance; actions of the soldier on the battlefield during use of weapons of mass destruction; flame-thrower and incendiary mixtures and methods for defense against them.

The reviewers conclude that, "despite certain shortcomings, the brochure can be used during the initial familiarization of soldiers with antichemical and antibacteriological defense in battle. However, insofar as aniatomic defense is concerned, other books are better suited."

164. Rifle Platoon Landing by Helicopter, and Attack Following an Atomic Attack

"Teaching a Rifle Platoon to Make a Landing in Helicopters Following an Atomic Attack," by Lt Col I. Andrukhov, Voyenny Vestnik, No 5, May 57, pp 45-51

The article gives a plan for making a landing by helicopter and tactical-combat assault and occupation of an objective in the enemy's rear following an atomic attack.

165. Hungarian Scientists on Study Tour in USSR

"Hungarian Scientists Abroad" (unsigned article), Budapest, Nepszabadsag, 12 Nov 57, p 2

Antal Reischl, professor at the Construction Industry and Transportation Technical University (Építőipari és Közlekedési Műszaki Egyetem), Endre Reuss, professor in the Faculty of Mechanical Engineering at the Technical University, and László Szalai, lecturer at the Physics Institute of the Szeged University of Sciences (Szegedi Tudományegyetem Fizikai Intézete), went to the USSR on a study tour, according to information in the article.

166. Hungarian Scientist Leaves for Bulgaria

"Hungarian Scientists Abroad" (unsigned article), Budapest, Nepszabadsag, 12 Nov 57, p 2

The article notes that Janos Kiss, lecturer in the Faculty of Natural Sciences at the Eotvos Lorand University of Sciences (Eotvos Lorand Tudományegyetem), left for Bulgaria.

167. Director of Moscow Observatory Visits East Germany

(unsigned article, Berlin, Neues Deutschland, 16 Nov 57, p 3

Professor Martynov, director of the Moscow Observatory, recently visited the main observatory of the East German Academy of Sciences in Potsdam-Babelsberg.

168. Hungarian Academician in East Germany

"News" (unsigned article), Budapest, Nepszabadsag, 12 Nov 57, p 8

Pal Gomori, Corresponding Member of the Hungarian Academy of Sciences (Magyar Tudományos Akadémia), headed a delegation which left for Berlin at the invitation of the East German Academy of Sciences.

169. East German and Bulgarian Science Academies Sign Agreement

(unsigned article), Cottbus, Lausitzer Rundschau, 30 Oct 57

An agreement was signed recently in Berlin by the East German Academy of Sciences and the Bulgarian Academy of Sciences on principles of 1958 scientific cooperation between the two countries.

170. International Scientific Conference Held in Liblice, Czechoslovakia

(unsigned article), Berlin, Der Morgen, 13 Dec 57

On 12 December a conference on the distribution of scientific work among socialist countries was held in Liblice near Prague, Czechoslovakia. The conference was sponsored by the Czechoslovak Academy of Sciences and was attended by representatives from the Academies of Sciences of the USSR, East Germany, Poland, Hungary, Rumania, and Bulgaria, as well as by members of ministry scientific institutes in Czechoslovakia. Discussions involved the coordination of long-range plans up to 1975, specialization in individual countries, and prices on the socialist world market.

171. Cooperation Between Science and Industry in Yugoslavia

"Industry Must Cooperate More Closely With Scientific Establishments," by N.P., Zagreb, Borba, 5 Dec 57, p 4

At a conference, held 4 December 1957 in the "Rudjer Boskovic" Nuclear Institute in Zagreb, representatives of industry and scientific institutes of Croatia discussed closer cooperation between science and industry. The institute, with its 200 specialists, has been working for years on semi-conductors and transistors, the use of radioactive isotopes in industry, agriculture and medicine, and on similar projects of interest to industry; yet, of 48 engineers doing postgraduate work in the institute, only one-third have been subsidized by industry.

There have been some instances of close cooperation between science and industry. The institute has helped the "TEZ" Factory in the production of fluorescent lights, has aided the "Rade Koncar" Factory, and has helped the "Torpedo" Factory to establish a center for materials testing with radioactive isotopes. Close cooperation has also been established in studying the possibilities of building nuclear power plants.

Representatives of industry proposed that factories establish their own laboratories and small institutes to supplement the work of scientific establishments and institutes.

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